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Original Articles.

HODGKIN'S DISEASE: A REPORT ON THE CASES OBSERVED AT THE COLLIS P. HUNTINGTON MEMORIAL HOSPITAL FROM APRIL, 1913, TO JULY, 1916, WITH SPECIAL REFERENCE TO TREATMENT WITH RADIUM AND THE X-RAY.*

By Channing C. Simmons, M.D., Boston,

and

George Benet, M.D., Boston.

[From the Cancer Commission of Harvard University.]

The following is a report on the cases of Hodgkin's disease and allied tumors of the lymph glands treated at the Collis P. Huntington Hospital from its opening in April, 1913, to July, 1916, a period of a little over three years. It was intended to report only the cases of Hodgkin's disease, but in studying the cases it was found on microscopic examination of the specimens, that three clinically Hodgkin's disease were lymphosarcoma. These three cases have been grouped separately, and are considered chiefly in regard to treatment.

The report represents the work of the whole staff of the hospital, and the data have only been collected and analyzed by the authors. The radiotherapy has been under the charge of Dr. William Duane. Especial mention should be made of pathological and experimental work done by Dr. E. E. Tyzzer, and clinical studies by Dr. Thomas Ordway.

Besides analyzing the cases, our object has been to try to determine the value of various forms of treatment, radium in particular.

During this three-year period, 31 cases, clinically diagnosed as Hodgkin's disease, applied for treatment. Three of these proved, on microscopic examination of the glands, to be lymphosarcoma. Of the remaining 28, specimens were available for study in 20, one of which proved to be metastatic carcinoma, while reports of the glands removed in other hospitals were obtained in 3.

In 5 cases no specimen was available for study, and the diagnosis is purely clinical. Twenty of the cases are dead, 7 coming to autopsy, and 10 are under treatment at the present time. These for the most part are cases that have come under observation since January, 1916.

For the purpose of this report the 19 cases of Hodgkin's disease, proved by personal examination of the microscopic specimen, are alone considered. The three cases in which we have a report on glands removed at other hospitals are excluded, as the description of the specimen was too brief. The three cases of lymphosarcoma are considered separately.

Much has been written in recent years on Hodgkin's disease and allied affections of the lymph nodes, and no attempt will be made here to review the entire literature. Some years ago it was considered a form of tuberculosis by many (Steenberg[1]), but this has been pretty generally disproved. At present it is considered to be either the result of an infection, or as a tumor growth. Cunningham[2] says the evidence of its being an infection is:

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* Submitted to the Cancer Commission for publication January 1, 1917.

1. The histology of the glands suggests an infection.
2. The injection of emulsions of glands has caused lymphatic enlargement.
3. The fever suggests an infectious process.
4. There is a slight leucocytosis.
5. There is an exudate where serous membranes are involved.

Bunting and Yates,[3, 4, 5] who have written extensively on the subject in the past few years, believe the disease infectious, and have isolated a diphtheroid bacillus with which they claim to have caused Hodgkin's disease in a monkey. This bacillus is evidently the same found by Negri and Miermet,[6] and since then by many others, Rosenow[7] finding it in 38 out of 40 cases. Practically every one writing since the article by Bunting and Yates appeared has been able to demonstrate this bacillus in some of their cases. Rosenow[8] has done special work on the method of obtaining cultures from lymph glands, ovaries and other tissues, and Bloomfield[9] has shown bacteria of many different varieties in many so-called normal lymph glands. In their last article Yates and Bunting[10] say they have no final proof of the etiological relation of the diphtheroid bacillus to the disease. They[11] also claim that Hodgkin's disease, lymphatic leukemia, mycosis fungoides, Banti's disease and lymphoma are different forms of the same disease, but this view is not generally accepted, and most observers consider Hodgkin's disease a distinct entity with a definite pathology. Others, as Warfield and Kristjanson,[12] have been able to study glands removed at different times from a given case, which in the first instance showed lymphosarcoma, and later typical Hodgkin's disease. The blood at the time the second specimen was removed was typical of lymphatic leukemia. We have seen the blood in cases of Hodgkin's disease when, for a single day, the percentages of polymorphonuclear neutrophiles and lymphocytes have been reversed.

The adherents of the tumor theory say that Hodgkin's disease, in its later stages at least, acts as a malignant tumor forming metastases in organs where there is normally no lymph adenoid tissue. Yamasaki[13] and Karsner[14] recognize this but consider the disease a granuloma which may, in its later stages, take on the form of a pleomorphic sarcoma.

In this series of cases the diphtheroid bacillus was found by Ordway in two out of the three cases in which it was sought, and we still have it in pure culture from Case 7.

Case 2. Cultures made from a gland removed from below the angle of the jaw. Blood agar: contaminated. Agar agar: scanty growth of diphtheroid bacilli. Special media: few colonies of diphtheroid bacilli. After the third transplant the bacilli failed to grow.

Case 7. Culture made from an emulsion of a gland removed from the axilla. Slight growth of diphtheroid bacilli on dextrose agar, dextrose bouillon, plain bouillon, agar agar, and blood agar. Profuse growth on special media showing club forms, with parallel order and suggestion of polar granules. Bacilli still growing in pure culture after many transplants (21 months later).

Case 31. Cultures made from gland removed from over the right scapula in several media. No growth in any.

The following experiments were made by Dr. E. E. Tyzzer: Monkeys were inoculated with emulsions of glands removed from Cases 1, 2, and 4 made by grinding the gland tissue in a mortar with salt solution. Injections were made into the axial lymph nodes, and pieces of tissue were also implanted subcutaneously in several places. The monkey inoculated from Case 1 died three months later of tuberculosis. An autopsy showed tuberculosis of the various organs, but no other lymphatic change. The monkey inoculated with a portion of the gland from Case 2 was well at the end of 10 months. Tuberculin reaction was negative. The monkey inoculated from Case 4 received some of the gland emulsion into the peritoneal cavity. He was well two months later, at which time he was used for another experiment. Guinea pigs were also inoculated in the peritoneal cavity with an emulsion of a gland removed from Cases 1, 4, and 7. At the end of several months they appeared in normal health and were rearing young. In Case 5 at the time of removal of a gland for diagnosis, a small piece was implanted under the skin of the patient. This was palpable for several days but diminished in size and had entirely disappeared ten days later. (Case reported by Tyzzer[15].)

ETIOLOGY.

Sex. In the series of 19 cases of Hodgkin's disease, proved by microscopic examination of glands removed, there were 6 females and 13 males. Zeigler,[16] in his monograph reporting 220 cases, had 71 females and 149 males.

Ages. The ages by decades were as follows:

10 to 20, 6 cases
20 to 30, 8 cases
30 to 40, 3 cases
40 to 50, 2 cases

Bunting[17] states that most males are under 33 and females over 34 at the time of appearance of the first symptoms. Our figures are:

Females over 33, 2; under 33, 4.
Males.. over 33, 3; under 33, 10.

The average ages were: females 26.5 years, males 26.7 years. The disease is essentially one of young adults.

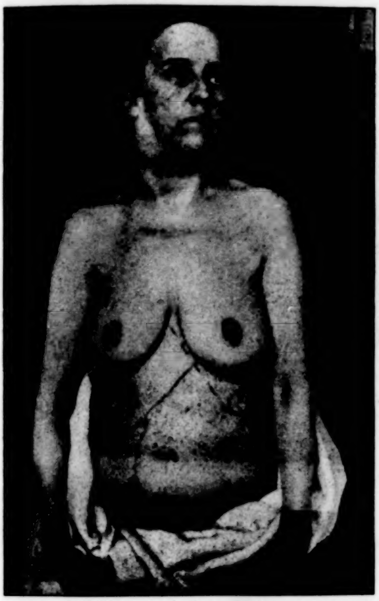

Fig. 1.—Case 10. Hodgkin's disease. (No specimen of the glands available for study.) Female, 34 years old. Disease of 30 months' duration. Masses of enlarged glands in the right side of the neck, and enlargement of the spleen. (See Fig. 2.)

Glands Involved. The glands involved first and for which the patient sought treatment were as follows: neck 16 cases, chest (cough) 2 cases, groin 1 case. In every case the glands were enlarged, when the patient sought treatment, in more than one region. The mode of onset was often suggestive of an infectious origin, particularly when the glands of the neck were first noticed. The patients in 4 cases (Cases 4, 14, 24, 28) stated that the masses appeared in the neck shortly following a pharyngeal infection—in three cases "grippe" and in the fourth an acute tonsillitis with abscess. The history of Case 14 is typical and suggestive.

Case 14. Male, 44 years old. Had a sudden attack of grippe two months ago with malaise, fever, and swollen glands in the neck. These glands persisted after his recovery from the acute infection. A gland removed two months after the onset of the disease showed typical Hodgkin's disease on microscopic examination.

Cases 2 and 5 were "subject to colds," and in the latter the glands in the neck appeared shortly after an attack of erysipelas. In Case 26 the glands appeared during an attack of bronchitis. In the cases where the bronchial glands were first affected no possible etiological factor was noted. We have no cases primary in the abdominal glands, and the spleen was noted as enlarged in only four cases (Cases 4, 12, 14, 17).

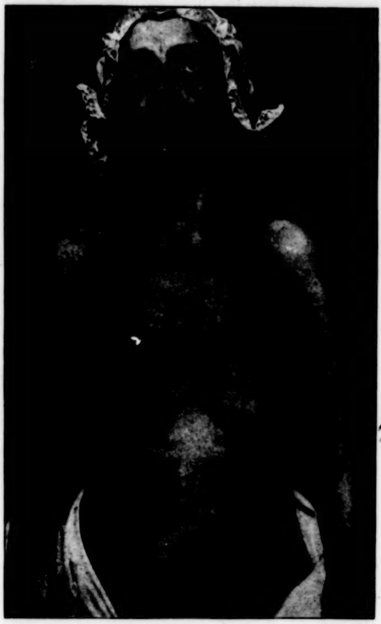

Fig. 2.—Case 10. Four weeks after beginning radium treatment. The masses of glands in the neck have nearly disappeared, and the spleen has diminished in size. The general condition, however, has failed appreciably. Death six months later. (See Fig. 1.)

Duration. The average duration of the disease before applying to the Huntington Hospital for treatment was 18 months, and of the three cases classed as lymphosarcoma, 30 months. The total duration of the disease from the first symptom till death in the 14 cases in which the outcome has been fatal is as follows:

Less than 1 year	6 cases
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The remaining five cases are under treatment at the present time. Most of our cases, therefore, are what may be called the acute type of the disease, a rather larger proportion than usual. One thing has been very striking—the to review the entire literature. Some years ago it was considered a form of tuberculosis by many (Steenberg[1]), but this has been pretty generally disproved. At present it is considered to be either the result of an infection, or as a tumor growth. Cunningham[2] says the evidence of its being an infection is:

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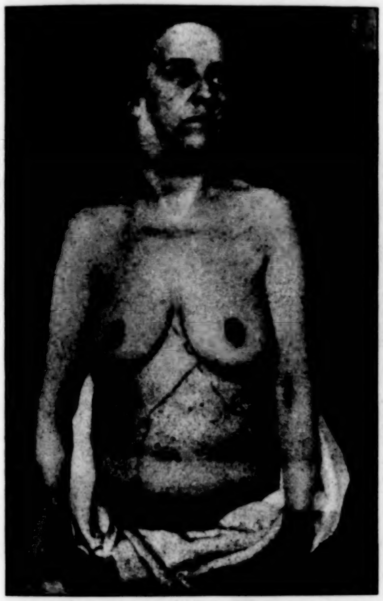

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The remaining five cases are under treatment at the present time. Most of our cases, therefore, are what may be called the acute type of the disease, a rather larger proportion than usual. One thing has been very striking—the sudden decline and death in a few weeks of patients who have left the hospital improved both as regards the glands and the general condition, and very much encouraged.

Types. Cunningham speaks of the symptomatic and latent type of Hodgkin's disease, and divides the symptomatic into an acute and a chronic form. The division is purely arbitrary, but cases do fall in these groups. The acute cases are those having an acute onset with fever and other symptoms of infection, which run a rapid course to a fatal termination in 2 or 3 months. In the chronic type the symptoms are the same but with periods of remission, and the disease runs a longer course but eventually ends in death. In the latent cases the glands exist for years with little variation in size and with few subjective symptoms, but the cases progress slowly and death finally ensues.

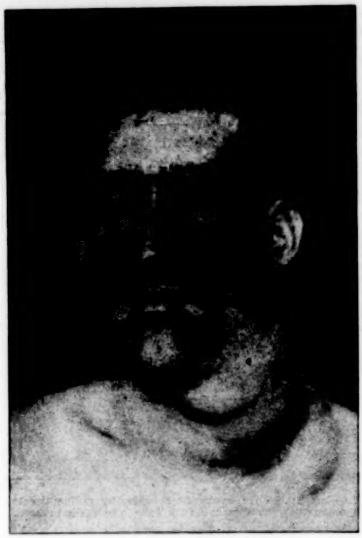

FIG. 3.—Case 22. Male, 27 years old. Tumor of neck for past six years. Photograph before treatment, taken in December, 1915.

Symptoms. The course of the disease, with or without treatment, is essentially chronic and characterized by exacerbations with increase in the size of the glands, fever, loss of weight, etc. These are followed by remissions where the glands diminish in size and, the patients often say, disappear, but we have always been able to demonstrate them on careful palpation. Even when the glands of the neck, for example, diminished in size and the general condition improved, there was often a slowly progressive enlargement of the mediastinal glands, and these latter did not seem to vary in size as did those of the neck, although this is very difficult to determine with any degree of accuracy.

The chief subjective symptoms were general weakness and loss of weight. In the more acute cases there was fever of a remittent type. Pain was present at some time during the course of the disease in many instances, but was probably always due to pressure of the glands on adjacent nerves.

CASE 1. Severe pain in the arm, probably due to pressure on the brachial plexus.

CASE 5. Severe neuralgic pain in the fifth nerve.

CASE 8. Symptoms of a transverse myelitis when first seen, which gradually cleared up.

CASE 28. Right facial paralysis.

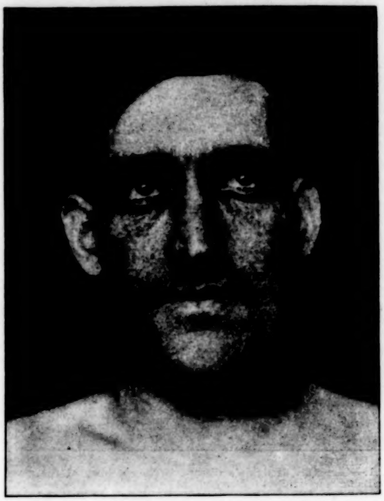

FIG. 4.—Case. 22 (see Fig. 3). Photograph taken in November, 1916, showing reduction in size of mass of glands in the neck after radium treatment. There is a diffuse mass of tissue adherent to the zygoma that appeared in October, 1916, and many small palpable glands still remain.

There were many other symptoms due to pressure from glands which developed during the course of the disease. Two cases had exophthalmos (Cases 14, 28). Other cases had ascites, pleural effusion, dyspnea, etc.

The glands varied very much in size, both with and without treatment, and were present at the first examination in more than one region in every case. Three patients came in once and were given appointments for radium treatment, but by the day set the glands had so diminished in size they failed to keep them. They reported later when the glands became large again, and two have since died. Weakness, loss of weight and anemia were present in a greater or less degree in every case, although in the remissions or as the result of treatment it improved. Progressive anemia, however, was the rule.

The Wassermann test was made in 16 cases. It was positive in 3, doubtful in 1, and negative in the others. It apparently signified nothing in regard to the disease.

Temperature. The temperature was elevated at some time during their stay in the hospital in 11 cases. It was normal in 4, and rather subnormal in 4. The fact that it was not elevated means, in most instances, nothing, as the observations did not extend over a long enough period. On the other hand, Case 1 was under observation six months and died in the hospital. She ran a subnormal temperature the entire time. Several of the other cases with normal temperatures were under observation two or three months. The character of the temperature was its extreme irregularity.

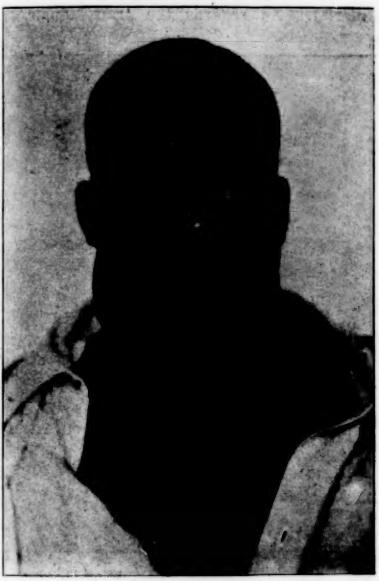

Fig. 5.—Case 14. Hodgkin's disease. Masses of glands in both sides of the neck. (See Figs. 6 and 7.)

Spleen. The spleen was noted as being enlarged, clinically, in 3 cases. In the 6 cases coming to autopsy it was enlarged in 3, in one of which it was not noted clinically, and slightly enlarged in one other. In three of the autopsies the organ contained nodules, although in one of these it was normal in size. In the case in which the spleen was slightly enlarged it appeared normal on section.

Skin. Skin lesions have been mentioned as occurring. Case 9 presented many keratoses. This patient received Fowler's solution, and the arsenic may have had some relation to the eruption. It was present a year after the discontinuance of the drug, however.

Blood. Blood examinations were made on 17 of the 19 cases. There was one observation on 5 cases, two on 8, three on 2, and nine on 1. Bunting and Yates[17] state that the blood in Hodgkin's disease is quite typical. According to them, there is a relative and an absolute increase in the transitional forms, and an increase in the basophiles, while the white count in the early stages is less than 10,000. Later there is a slight increase in the eosinophiles and the white count is over 10,000. The lymphocytes are always slightly increased. In the very late stages there is an increase in the polymorphonuclear neutrophiles.

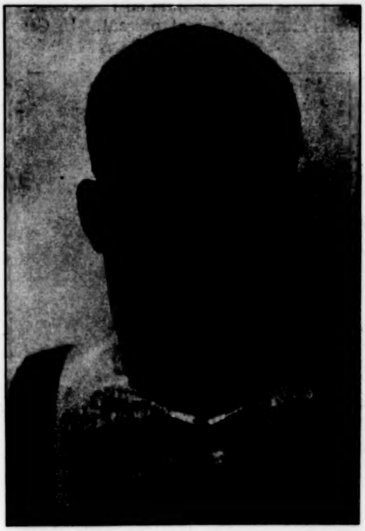

Fig. 6.—Case 14 two weeks after the first treatment with radium, showing marked diminution in size of the glands in the neck.

In Warfield and Kristjanson's case, previously mentioned, a gland removed showed lymphosarcoma, but two months later a second gland removed showed typical Hodgkin's disease, while the blood at this time was characteristic of lymphatic leukemia. If corroborated by others, this would lend strength to Bunting's theory that all diseases of the lymphatic system are different manifestations of the same condition. On the other hand, we have known a temporary reversal of the proportions of the lymphocytes and polymorphonuclear neutrophiles to occur.

We have not a sufficient number of observations in any one case to draw conclusions in regard to the blood changes. As a rule, the blood showed a slight anemia. Occasionally with treatment the anemia diminished, but it was usually slowly progressive. The white count was in most instances somewhat increased, but was never that of a leukemia, 35,000 being the highest recorded, but 90% of these were neutrophiles. The polymorphonuclear neutrophiles were increased in most instances, that is, over 75%. In Case 1 there were 90% one year before death, and in Case 6 86% nine months before death. In Case 31 there has been a fairly constant rise in the past year (nine observations).

The lymphocytes were usually somewhat increased, but the counts were not made in reference to the effects of radium on these cells. Dr. Forbes is studying this at present. In Case 23 differential counts made one and three weeks after treatment with radium of 1023 millicurie hours, showed 40% and 70% lymphocytes respectively. Case 31 received considerable radium treatment and counts were made about once a month. The lymphocyte count fell in this case, being highest, 20%, before treatment. On the other hand there was only 8% in July although the patient had received no treatment for three months. Case 30 received 4 treatments with radium in four weeks of 3320 millicurie hours. A differential count two days after the last treatment showed 2% lymphocytes. In general it may be said that radium diminishes the lymphocytes, the maximum effect being seen about two weeks after treatment.

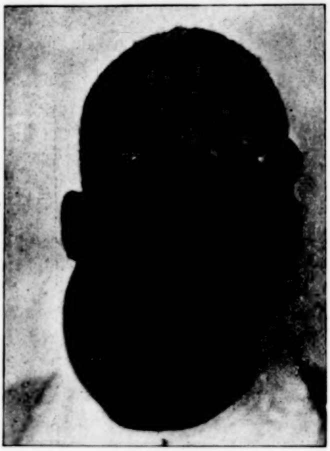

FIG. 7.—Case 14. Photograph taken four months after Fig. 6. The masses of glands in the neck have recurred and there is a mass of tumor tissue in the left orbit. Death one week later. In the two previous photographs of this case, the left eye is slightly more prominent than the right.

No special platelet counts were made, but their appearance was noted in making the differential counts. We do not feel that much stress can be laid on this, as so much depends on the portion of the drop of blood taken, technic, etc. A note that they were diminished is probably a correct observation, but when they are noted as increased we feel that there is a chance of error.

We have gone over the examinations with special reference to the statement of Bunting and Yates, and while many do not correspond to their observations, about one-half can be made to conform. The percentage of polymorphonuclear neutrophiles said by them to be normal, 60 to 70, is much lower than other observers (Miller[18]). As regards the transitionals, the classification of these forms by different men varies, and what one calls large mononuclears others term transitionals. It is by transferring cells from the mononuclear to the transitional group that will make some of the blood examinations conform to those said to be typical by Bunting. Most of our blood examinations were made by one person. The third observations in Case 1 and Case 4 are examples. Case 31 shows an increase, almost constant, of the polymorphonuclear neutrophiles, with but little change in the transitionals. This patient at the present time is practically well, but still shows an increased area of dulness under the sternum, which was present at the first visit one year ago.

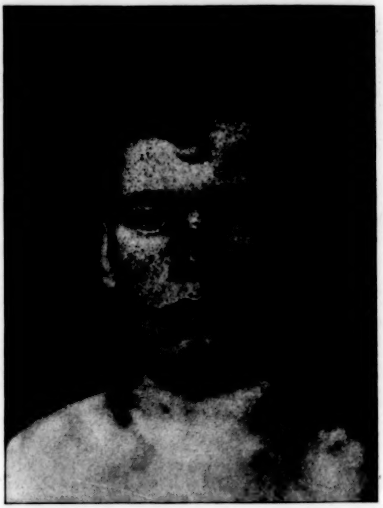

FIG. 8.—Case 26. Hodgkin's disease. Male, 11 years old. Eighteen months' duration. Masses of glands in the left side of neck. There were a few small glands in the right side. (See Fig. 9.)

HODGKIN'S CASES. BLOOD CHARTS.

	CASE 1			CASE 2	CASE 3	CASE 4		CASE 5			CASE 6		CASE 7		CASE 8	
	APR., '12	OCT., '12	JLY., '13	JAN., '14	NOV., '12	MAR., '13	APR., '13	DEC., '12	MAR., '13	AUG., '13	AUG., '13	APR., '14	JAN., '14	APR., '14	AUG., '14	SEP., '14
Polymorphonuclear neutrophiles	81	90	85.5	..	..	77	..	..	76	72.5	86	80	76	75.5	75.5	76
Lymphocytes	15	4	...	..	..	9	..	..	16	26.5	..	..	14.5	22.5	20.8	20
Large mononuclear	...	1	12.5	..	..	8	..	..	4	...	12	18	5	1.5	3.3	..
Basophiles	...	..	1	..	..	..	..	..	..	...	2	..	1	...	...	..
Eosinophiles	1	1	...	..	..	1	..	..	2	...	..	..	1	.5	.2	..
Transitional	.5	4	1	..	..	5	..	..	2	1	..	2	...	...	.2	..
Immature	...	..	...	..	..	..	..	..	..	...	..	..	2.5	...	...	4
Mast cells	...	..	...	..	..	..	..	..	..	...	..	..	...	...	...	..
			Died Oct., '12	Died Oct., '15	Died		Died Jly., '13			Died Sept., '13		Died May, '14		Died Apr., '15		Died Mar., '15
	Reds 4,392,000 White 14,000 Hgb. 81%	Reds 3,664,000 White 22,400 Hgb. 65%	Reds 3,656,000 White 12,400 Hgb. 70%	Reds 3,888,000 White 22,000 Hgb. 80%	Reds 4,816,000 White 9,600 Hgb. 90%	Reds 3,320,000 White 1,000 Hgb. 80%	Reds White 8,000 Hgb. 80%	Whites 10,600 Hgb. 85%	Reds 3,408,000 White 8,000 Hgb. 70%	Reds 6,424,000 White 10,200 Hgb. 87%	Reds 4,888,000 White 18,000 Hgb. 80% Plates +		Whites 12,000 Plates +	Reds 2,880,000 White 10,000 Hgb. 60%	Reds 5,000,000 White 7,400 Hgb. 66%	Reds 5,120,000 Whites 7,000 Hgb. 75%

HODGKIN'S CASES. BLOOD CHARTS (*Continued*).

	CASE 11		CASE 12			CASE 13		CASE 14	CASE 17			CASE 22		CASE 23		CASE 26
	JAN., '16	FEB., '16	MAY, '15	SEPT., '15	DEC., '15	JUN., '15	JAN., '16	JLY., '15	SEPT., '15	APR., '16	MAY, '16	NOV., '15	OCT., '16	FEB., '16	MAY, '16	MAY, '16
Polymorphonuclear neutrophiles	75	70	76	84	81	88	..	79	80	76.5	80	66.25	65	52	12	73
Lymphocytes	21	21	8	10	10	8	..	20	10	9	14	14.75	8	40	70	5.5
Large mononuclear	1	2	4	20	..	1	..	..	4	5	2	15.5	21	5	6	16.5
Basophiles	2	..	..	..	..	2	..	..	2	...	..	....	..	2	12	...
Eosinophiles	1	..	1	..	3	..	..	..	..	2	2	1	5	.5	..	...
Transitional	..	7	10	4	6	2	..	..	4	6	..	....	..	.5	..	5
Immature	..	..	..	..	..	..	..	..	..	1.5	..	.75	..	...	..	...
Mast cells	..	..	..	..	..	..	..	1	..	...	..	.75	1	...	..	...
					Died June, '16		Died Jan., '16	Died Nov., '15							Died Mar., '16	Died Jly., '16
	Plates normal	Plates +	Reds 4,800,000 Whites 18,000 Hgb. 90% Plates +	Reds 5,200,000 Whites 9,800 Hgb. 90%	Plates + Plates normal	Reds 3,200,000 Whites 20,000 Hgb. 65%	Reds 2,400,000 Whites 10,000 Hgb. 60% Plates normal	Reds 5,440,000 Whites 8,600 Hgb. 90% Plates +	Reds 5,168,000 Whites 10,400 Hgb. 90%	Whites 10,800 Plates normal		Reds 3,504,000 Whites 13,200 Hgb. 80%	Whites 10,400	Reds 2,592,000 Whites 5,400 Hgb. 65%	Reds 2,672,000 Whites 4,000 Hgb. 50% Plates —	Reds 3,440,000 Whites 6,000 Hgb. 70% Plates +

HODGKIN'S CASES. BLOOD CHARTS (*Concluded*).

	CASE 28		CASE 30	CASE 31								
	APR., '16	OCT., '16	JUNE, '16	NOV., '15	DEC., '15	JAN., '16	FEB., '16	MAR., '16	APR., '16	JLY., '16	SEPT., '16	NOV., '16
Polymorphonuclear neutrophiles	57	82	90.5	74.83	78.8	77.7	77.25	85.5	80	88.66	88	85
Lymphocytes	37	14	2.5	20.71	12.5	10.6	12.25	8	10.25	8	4	13
Large mononuclear	5	2	2	1.08	.25	1.3	1.25	.5	....	....	8	6
Basophiles	...	..	...	.15	.25	...	.5	...	....	1	..	...
Eosinophiles	.5	2	...	.3	.75	1.1	.5	...	.25	....	..	.5
Transitional	...	..	5	2.93	9.25	8.8	8.25	6	9.5	2.33	..	...
Immature	...	..	...	....	....	...	....	...	....	....	..	...
Mast cells	...	..	...	....	....	...	....	...	....	....	..	...
	Reds 3,576,000 Whites 9,600 Hgb. 78%		Reds 2,064,000 Whites 35,000	Reds 3,742,000 Whites 16,000 Hgb. 80%	Whites 12,800 Plates normal	Whites 9,600	Whites 9,400 Plates normal	Whites 8,000	Whites 8,800 Plates normal	Whites 9,600 Plates normal	Whites 12,400 Plates dimin.	Whites 16,000 Plates dimin.

TREATMENT.

The treatment of these cases by radium and by the x-ray is followed by a marked temporary amelioration of symptoms, by a diminution in the size of the glands, and by improvement in the general condition, but it must be admitted that in the majority of the cases it has not prevented the progress of the disease to a fatal termination.

Radium and the x-ray have a selective action on tissues of the lymphadenoid type, and in Hodgkin's disease reduction in the size of the glands without burning or necrosis follows treatment, and there is a definite relation between the treatments and the effect on the gland. In this respect the action is different from that on carcinomatous tissue, where necrosis is to be expected.

That the radium treatment has not permanently arrested the disease, we feel is due in part to the fact that the treatments have been limited in almost every instance to the masses of palpable glands in the neck, axilla, or groin. A few cases only received treatments over the spleen, abdomen or sternum, but probably of insufficient strength to have much action on the deeply situated glands. We believe, from a study of these cases, that from the first there should be systematic treatment of the glandular regions of the body, whether there is evidence of enlargement of the glands or not, as the disease affects more or less all the lymphadenoid tissue. In all cases coming to autopsy, the mediastinal glands were involved, and our efforts should not be limited to a single group of glands as it is useless to treat those in the neck and ignore those in the mediastinum. In the nine cases that received considerable radium treatment, glands were noted as present in the mediastinum in 5, and probably present in 3 others.

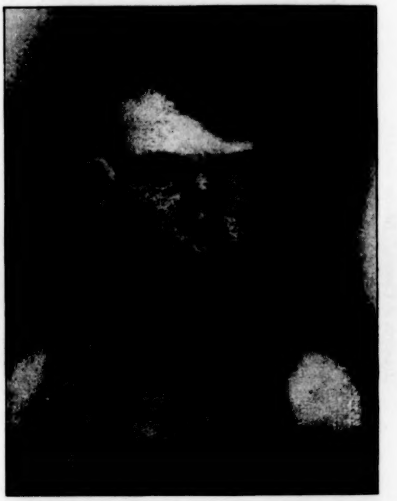

FIG. 9.—Case 26 two weeks after the first treatment with radium. Marked decrease in the size of the glands. Patient continued to improve under treatment until discharged two months later. Death six weeks after discharge. (See Fig. 8.)

Of the 19 cases of Hodgkin's disease, proved by a microscopic examination of one of the glands, 14 are dead and 5 are under treatment. The efficacy of any given treatment in Hodgkin's disease should be taken reservedly, as such marked temporary improvement may take place spontaneously. The 5 cases living may represent the chronic form of the disease. Cases 17 and 22, of 18 and 27 months' duration respectively, are in poor condition. Cases 11 and 31, of 22 and 36 months' duration respectively, are in good condition, and have only a few small shot-like glands. Case 30 is in fair condition, but has had little treatment.

Radium. The radium has been used in the form of emanation, which is collected and sealed in a capillary tube. This in turn is enclosed in a small metal jacket. Each tube represents from 10 to 250 millicuries of emanation, the strength varying with the age of the tube. The tubes are applied to the patient with a 2 mm. lead and 2 or 3 cm. gauze screen, and are left in position from 1 to 12 hours. In a few instances the tubes have been inserted directly into the mass of glands. In the treatment of the mediastinal and other deeply situated glands, the tubes are raised 2 to 4 cm. above the skin in order to obtain a maximum dose with less danger of burning the skin. Some skin reaction is very apt to appear in from one to two weeks. There may be a marked constitutional disturbance with nausea and vomiting, prostration and some fever following treatment with either radium or x-ray. These symptoms appear soon after exposure.

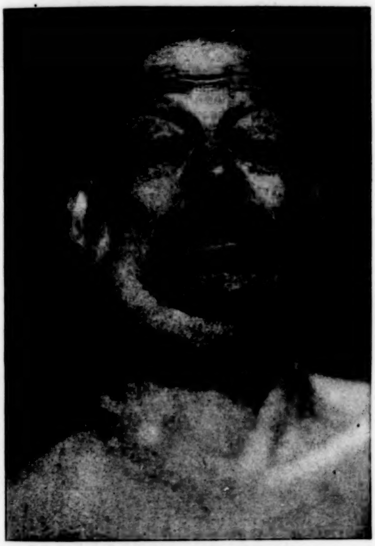

Fig. 10.—Case. 27. Lymphosarcoma of six years' duration. Male, 64 years old. A confluent mass in the right side of the neck and many discrete glands in the left side. There is also a mass of tumor tissue in the left upper eyelid. Death two weeks later. Autopsy.

Eighteen cases have received more or less radium treatment, but of these in only 13 was a specimen of a gland available for microscopic study. Of these 13 cases 3, now dead, received only one or two treatments, one being moribund when he entered the hospital. Of the remaining 10, 5 are dead and five under treatment, one having been under observation but a short time only. There are, therefore, 9 cases of Hodgkin's disease that have had sufficient treatment with radium to allow of conclusions being drawn as to its value. What sufficient treatment is, is difficult to say. The cases received applications from one to three times a month over periods of from three to twelve months, the usual treatment being from 600 to 1000 or more millicurie hours (see table). We are now using larger doses. In analyzing these nine cases, every one showed benefit by a diminution in the size of the glands and improvement in the general condition. The first effects on the glands were noted in from nine days to three weeks, averaging two weeks.

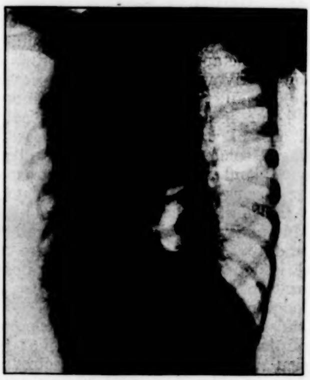

Fig. 11.—Case 5. Hodgkin's disease of four and one-half years' duration. Female, 17 years old. Radiograph of chest, showing mass of glands in mediastinum. Death 7 months later. Autopsy. (See Figs. 12 and 13.)

In the five cases in which no specimen of a gland was available for study, two had considerable treatment, and in these there was also marked improvement, beginning about two weeks after the first application of radium. The other three received only small amounts of radium and no benefit was noted.

X-Ray. Nine cases received considerable x-ray treatment, three of which also received radium, but no specimen was available for examination on two of these. Two had treatments on an average of once a week at other institutions for over a year with benefit. The amount was not measured, and both are now dead. Another case, excluded for lack of microscopic specimen, received treatments regularly for over three years. We also have observations on five other cases who received a small amount of x-ray treatment.

There are in this series but five cases carefully treated with the x-ray, where the dose is known. Four improved under treatment, and in all of them the improvement is noted as beginning about two weeks after the first treatment. In the fifth case there was no change noted in the size of the glands. All but one of the cases are now dead, and that one also received considerable radium.

The x-rays when measured were usually given at a distance of 25 cm. through an aluminum filter, and with a brass cone. The voltage was 70 K.V. (See table.)

The impression is that the patients improve in general condition, and the glands treated diminish in size with the x-ray, but that the improvement is not as marked as with radium. The x-ray treatments were also directed against definite masses of glands, and no attempt was made to radiate all the lymphadenoid tissue of the body, as we believe should be done.

Pathology. Of the 19 cases, autopsies were obtained in 6, and in 3 we have specimens of glands removed before and after treatment.

The microscopic appearance of Hodgkin's disease is now fairly well known, and a detailed description of all the specimens will not be given. All our specimens were the typical so-called Dorothy Reed type of the disease, in various stages, some cellular and others fibrous, and in one gland removed for diagnosis was much more fibrous than those examined later at autopsy. Gibbons[19] believes that the endothelial cells, lymphocytes and fibrous tissue all proliferate, and that the microscopic picture of a given case is dependent on the relative amount of proliferation of the different elements. He classes Hodgkin's disease as a tumor.

The glands in ten of our cases were composed mainly of large cells of the endothelial type with vesicular nuclei and little protoplasm. Giant cells were common and lymphocytes were present in small numbers, but had been almost entirely replaced by the growth of the new-formed cells. In several cases the large endothelial cells appeared to be undergoing mitosis, and in some sections small areas of necrosis were seen. Eosinophiles were present in all sections in varying numbers, but were not numerous (Cases 1, 3, 7, 11, 12, 17, 22, 23, 26, 28).

The gland capsule was thickened in many cases, but in not a single instance was it infiltrated by the cells. In Case 31, however, a nodule removed from over the scapula showed the cells infiltrating the fat. The tumor cells were also not encapsulated in the autopsy cases where the spleen or liver were involved, but were infiltrating, and it is for this reason that the disease has been considered as a malignant tumor in its later stages. On the other hand, lymphadenoid tissue is present throughout the whole body, and it is a well-known fact that lymph nodes can develop where they are not usually found. In a few cases the tumor masses appeared elsewhere than in a gland, as in Case 13 as multiple nodules in the breast; Cases 14 and 28, nodule in the orbit; Case 6, nodule in the skin; Case 31, nodule under the skin of the back.

Specimens from two cases were what may be

RADIUM TREATMENTS.

CASE	NUMBER TREATMENTS	TOTAL MILLI-CURIE HOURS	UNDER TREATMENT	IMPROVEMENT NOTED IN	OTHER TREATMENT	MEDIASTINAL GLANDS	REMARKS
2	14	9,440	9 mos.	2 wks.	x-ray	+	dead
11	21	12,586	7 mos.	gradual diminution	x-ray	0	good condition
12	15	10,156	12 mos.	18 days	0	+	dead
14	18	10,474	5 mos.	3 wks.	x-ray	?	dead
17	14	14,307	10 mos.	2 wks.	0	+	poor condition
22	11	12,990	8 mos.	2 wks.	0	?	poor condition
26	11	9,100	4 mos.	2 wks.	0	?	dead
28	15	11,447	3 mos.	9 days	0	+	dead
31	13	11,440	5 mos.	2 wks.	0	+	good condition
7	1	24	——	2 wks.	x-ray	+	dead
9	8	9,126	8 mos.	no improvement	0	+	dead, no specimen
10	23	11,232	6 mos.	2 wks.	0	+	dead, no specimen
13	5	small	8 mos.	no improvement	0	+	dead
15	9	6,434	6 mos.	no effect	x-ray	+	dead, no specimen
21	29	12,953	11 mos.	2 wks.	x-ray	+	dead, no specimen
23	1	1,024	——	no effect	0	?	dead
25	2	1,990	——	no effect	0	0	fair condition, no specimen
30	4	3,320	1 mo.	2 wks.	0	0	fair condition

X-RAY TREATMENTS.

CASE	TREATMENTS	UNDER TREATMENT	MILLIAMPERE MINUTES	EFFECT	OTHER TREATMENT	MEDIASTINAL GLANDS	REMARKS
2	"many"	24 mos.	——	improvement	radium	+	dead
4	6	2 mos.	165	improvement	0	?	dead
5	47	5 mos.	1370	improvement in 2 weeks	0	+	dead
6	22	8 mos.	790	no change	0	+	dead
7	22	6 mos.	565	improvement	radium	+	dead
9	25	10 mos.	1428	no change	radium	+	dead
11	10	4 mos.	510	improvement	radium	0	Good condition
18	"many"	36 mos.	——	——	0	+	dead
21	"many"	12 mos.	——	improvement	radium	+	dead
8	2	——	110	——	0	+	dead
14	3	——	——	——	radium	?	dead
15	1	——	——	no change	radium	+	dead, no specimen
19	1	——	100	——	0	+	dead, no specimen
24	1	——	——	no change	radium	0	recent case no specimen

HODGKIN'S DISEASE.

Case	Age	Sex	Blood	Duration	Treatment	Result
1	24	female	3 exams.	9 mos.	salvarsan	Dead. Autopsy.
2	22	female	0	8 yrs., 9 mos.	cancer residue vaccines salvarsan Fowler's	Dead.
3	25	male	0	4 mos.	salvarsan	Dead. Autopsy.
4	28	male	1 exam.	10 mos.	salvarsan x-ray	Dead.
5	17	female	2 exams.	5 yrs..	x-ray	Dead. Autopsy.
6	25	male	2 exams.	18 mos.	salvarsan x-ray	Dead.
7	40	female	2 exams.	3 yrs.	x-ray radium (little)	Dead. Autopsy.
8	18	male	2 exams.	18 mos.	x-ray (little)	Dead.
11	35	male	2 exams.	21½ mos. to date	radium x-ray	Under treatment. Good condition.
12	46	male	3 exams.	21 mos.	radium	Dead. Autopsy.
13	37	female	1 exam.	1 yr.	radium (little)	Dead. Autopsy.
14	44	male	1 exam.	8 mos.	radium x-ray	Dead.
22	27	male	2 exams.	18 mos. to date	radium	Under treatment. Condition fair.
23	17	male	2 exams.	1 yr.	radium (little)	Dead.
26	11	male	1 exam.	2 yrs.	radium	Dead.
28	18	male	2 exams.	7 mos.	radium	Dead.
30	27	male	1 exam.	11 mos. to date	radium	Under treatment. Condition fair.
31	19	female	9 exams.	3 yrs. to date	radium	Under treatment. Good condition.
17	27	male	3 exams.	2 yrs., 3 mos. to date	radium	Under treatment. Condition poor.

HODGKIN'S DISEASE. CLINICAL DIAGNOSIS ONLY.

Case	Sex	Age	Blood	Duration	Treatment	Result
9	female	25	3 exams.	2 yrs., 6 mos.	radium x-ray Fowler's	Dead.
18	male	20	1 exam.	5 yrs., 3 mos.	x-ray	Dead.
21	female	53	1 exam.	1 yr., 8 mos.	x-ray radium	Dead.
24	male	25	2 exams.	7 mos. to date	radium (little)	Under treatment (new case).
25	male	53	1 exam.	6 mos.	radium (little)	Dead.

PATHOLOGICAL REPORT ONLY AVAILABLE.

Case	Sex	Age	Blood	Duration	Treatment	Result
10	female	54	1 exam.	14 mos.	radium	Dead.
15	male	17	3 exams.	1 yr.	radium x-ray	Dead.
19	male	51	1 exam.	3 yrs.	radium (little)	Dead.

LYMPHOSARCOMA.

Case	Sex	Age	Blood	Duration	Treatment	Result
20	female	23	2 exams.	1 yr.	radium	Apparently perfectly well.
27	male	64	1 exam.	6 yrs.	radium (little)	Dead. Autopsy.
29	male	6	1 exam.	18 mos.	radium	Dead.

termed an earlier type than the foregoing, or correspond to the lymphatic type of Gibbons. In these there was some evidence of the anatomical structure of the gland remaining in places. The sections were composed chiefly of large lymphocytes, among which were many larger cells of the endothelial type and a few giant cells (Cases 8, 14).

Four specimens were of the fibrous type, and in these there was marked eosinophilia. The capsule was thickened, and the section was composed chiefly of fibrous tissue with islands of lymphoid, endothelial, and giant cells (Cases 2, 4, 13, 30).

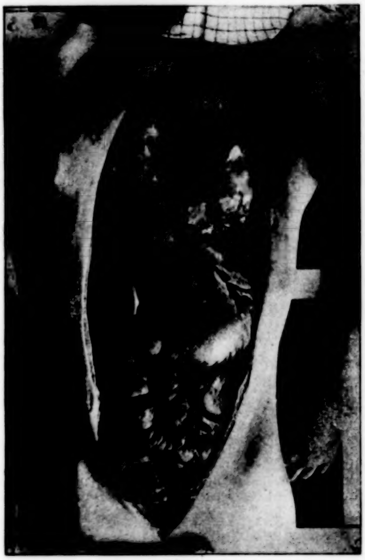

FIG. 12.—Case 5. Organs *in situ*, showing mass of tumor tissue in mediastinum.

In two cases we have sections of glands treated and untreated, both after x-ray. There are also two specimens removed for examination shortly after radium treatment.

CASE 5. Received 35 treatments with the x-ray, to the glands of the neck only, during the three months immediately preceding death. At autopsy the glands of the neck presented the appearance of cellular Hodgkin's disease of the endothelial type, but there was some infiltration of the surrounding fat. A gland from the peritoneal cavity presented the same appearance, but there were some necrotic areas.

CASE 6. Received 40 x-ray and 2 radium treatments directed against the glands of the neck and axilla. At autopsy these were no different than the peritoneal glands,—both showed the cellular type of Hodgkin's disease.

CASE 31. A nodule was removed from over the scapular, and also an axillary gland, both having previously received intensive radium treatment. The subcutaneous nodule was distinctly fibrous and the gland cellular, but no change due to the treatments could be demonstrated.

The following is a brief abstract of the autopsies and a description of the specimens. As these are typical, a detailed description of the rest of the specimens is omitted.

CASE 1. Masses of enlarged lymph nodes in both sides of the neck and above the clavicles which were continuous with a large mass in the mediastinum. This had compressed the lungs and eroded the costal cartilages, ribs, and sternum. Fluid in both pleural cavities. The axillary glands were enlarged, as were also the periaortic and inguinal. The spleen and liver were normal.

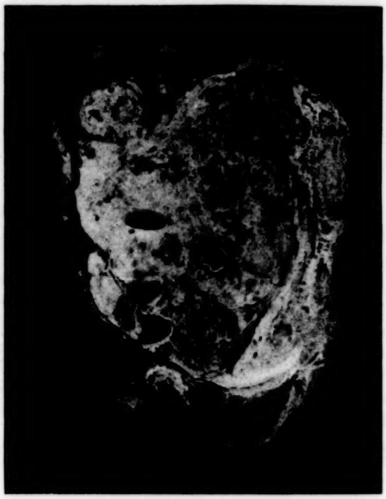

FIG. 13.—Case 5. Cross section of the thoracic organs. The lungs are compressed by the mass in the mediastinum and the left contains several nodules of tumor tissue.

Microscopic examination: Gland from neck removed six months before death. Capsule thickened. No normal anatomy of gland distinguishable. There were a few normal lymphocytes, but the bulk of the section was composed of cells larger than lymphocytes with vesicular nuclei lying in a fine stroma of fibrous tissue. In parts of the section there was much dense fibrous tissue and there were many eosinophiles. In the cellular portion were many large endothelial cells with vesicular nuclei and granular cytoplasm. They aften presented well-marked nucleoli. Giant cells of the endothelial type with two to four vesicular nuclei were common.

Axillary gland removed at autopsy. This section was similar to the previous one, but of a rather more cellular type. The capsule was thin and not invaded. Lymphocytes were present and were in considerable numbers under the capsule. The section was composed chiefly of large endothelial and giant cells. There was little fibrous tissue.

Case 3. Cervical lymph glands on both sides of the neck, enlarged and continuous with a large mass in the mediastinum which had eroded the sternum and invaded the left lung. The periaortic, pancreatic, and axillary lymph nodes were also much enlarged. The pancreas, liver and spleen were normal.

Microscopic examination: cervical gland. No normal anatomy of a lymph node remained. The lymphoid cells were practically entirely replaced by larger cells with vesicular nuclei and there were also many large endothelial cells. Giant cells were common. In places there was considerable fibrous tissue and there were many eosinophiles. A few of the endothelial cells were undergoing mitosis. There were several small areas of necrosis.

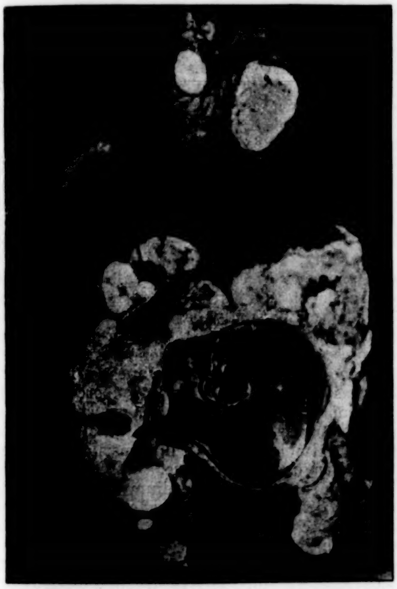

Fig. 14.—Case 3. Male, 25. Hodgkin's disease. Duration six months. Cross section of thoracic organs removed at autopsy. A mass of glands in the mediastinum surrounding the heart, and masses of tumor tissue in the lungs.

Gland from mediastinum. The section was similar to the foregoing, but there was more newformed fibrous tissue which divided the gland into cellular islands. There were many lymphocytes, but the cells were mainly of the endothelial type and giant cells were numerous. There were many eosinophiles.

Mesenteric gland. This appeared to be practically normal. The anatomy could be distinguished, but among the lymphoid cells were a few large endothelial cells.

Case 5. Glands in both sides of the neck enlarged. Large tumor mass in the mediastinum, which had compressed the lungs and eroded the vertebrae. Large mass of glands about the pancreas and root of the mesentery. Liver enlarged but normal on section. Small tumor nodule in the spleen. Axillary glands enlarged on both sides.

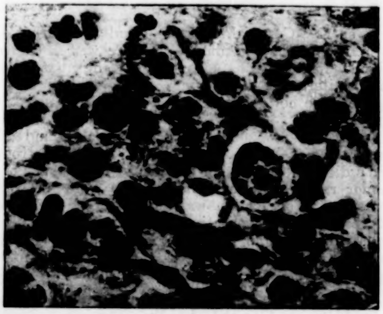

Fig. 15.—Hodgkin's disease. Section from gland removed from the neck of Case 8. Magnification 1500 diameters. The tissue had the appearance of a tumor and is composed of large endothelial cells, and of cells somewhat smaller, but of the same character. There are a few lymphocytes in the field. (Male, 18. Disease of 22 months' duration.)

Microscopic examination: Axillary gland. Cellular type of Hodgkin's disease. The capsule was thickened and there was no normal anatomy of the gland to be distinguished. There were many small areas of lymphoid cells, but the section was chiefly composed of large cells with vesicular nuclei and ill-defined cytoplasm. There were many endothelial and giant cells and a few eosinophiles.

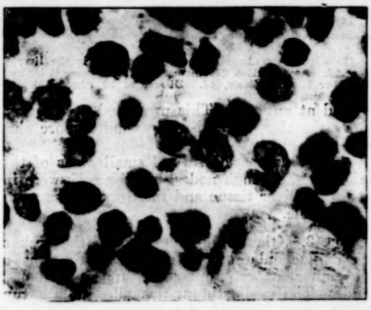

Fig. 16.—Section of gland of Case 27. Magnification 1500 diameters. Lymphosarcoma. The cells are all of the lymphoid type with little cytoplasm, and lie in a fine fibrous stroma. A thin walled blood vessel is to be seen. (Male, 64. Tumor of six years' duration.)

Mediastinal gland. The section was similar to the preceding except that there were many small areas of necrosis.

Case 7. The cervical, periaortic and peripancreatic lymph glands were much enlarged. There was slight enlargement of the mediastinal glands only. The spleen was enlarged and contained several areas of tumor tissue, and many small areas were also found in the liver. Some chronic peritonitis about spleen. A pure culture of the diphtheroid bacillus was obtained from the glands.

Microscopic examination: Section from two lymph nodes showed the same condition. There was no normal anatomy to be made out. The sections were composed of lymphocytes, large endothelial, and very large giant cells. Several of the endothelial cells showed evidence of mitosis.

Case 12. Cervical, bronchial, and retroperitoneal lymph nodes much enlarged. There was a mass of glands about the pancreas infiltrating that organ and obliterating the common duct. The liver and spleen were both enlarged and contained nodules of tumor tissue.

Microscopic examination. Cervical gland six months before death. Very cellular type of Hodgkin's disease, the section having the appearance of a tumor rather than a gland. There were few lymphocytes. The section was composed of fine bands of fibrous tissue separating small and medium-sized cells with vesicular nuclei. The cytoplasm and cell outlines were poorly marked. There were many larger endothelial cells and giant cells.

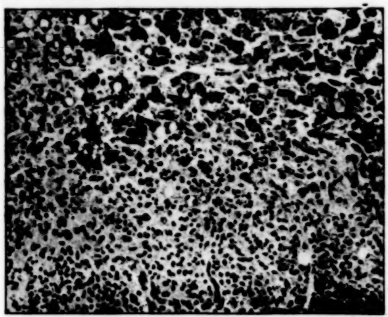

Fig. 17.—Hodgkin's disease. Section of nodule in the liver from Case 12. Magnification 240 diameters. The disease is infiltrating the liver tissue. (Male, 46. Disease of 19 months' duration.)

Gland at autopsy: This presented a similar picture to the above, but there was much more fibrous tissue.

Liver: This showed several small areas of tissue similar to the lymph nodes, but the cells were infiltrating the liver tissue and there was no suggestion of a capsule.

Case 13. Glands in both sides of the neck and both axillae enlarged. Right breast contains several tumor areas similar in appearance to the glands. The mediastinum was filled with a tumor growth which eroded the sternum. There was fluid in both pleural cavities. There was a mass of glands about the pancreas and abdominal aorta and several small ones in the pelvis. The spleen and liver were enlarged, but appeared normal on section. The inguinal glands were involved.

Microscopic examination: Cervical gland. The normal arrangement of the gland could be distinguished in places. The capsule was much thickened. The section was composed of large lymphocytes and endothelial cells, and in places there was an unusually large number of giant cells. There were also many eosinophiles.

SUMMARY.

We believe there is a distinct disease of the lymphatic tissues called Hodgkin's disease, which can be separated from Banti's disease, lymphatic leukemia, etc. We have had no opportunity to substantiate Warfield's and Kristjanson's observations. We found the diphtheroid bacillus in two out of the three cases in which it was sought, and think it can probably be demonstrated in many of the cases. The inoculation experiments in Guinea pigs and three monkeys were negative, and the piece of gland transplanted subcutaneously in the same patient from whom it was removed, atrophied and disappeared, which is an important observation, as a fragment of sarcoma or carcinoma treated in a like manner would probably have grown. This fact is rather against the tumor theory.

Microscopically, the glands were typical of what is known as the Dorothy Reed type of Hodgkin's disease, and were similar to the cases reported by Reed,[20] Longcope,[21] and Simmons.[22] The cases of lymphosarcoma presented microscopically an entirely different appearance, and in the one case that came to autopsy no gland examined had the slightest resemblance to Hodgkin's disease.

Clinically, Hodgkin's is a fatal disease, that runs an acute or chronic course, little affected by treatment as regards the ultimate fatal result, It may usually be suspected, but there is no way to make a definite diagnosis without a microscopic examination of one of the glands. It cannot be differentiated clinically from certain cases of lymphosarcoma, tuberculosis, or even inflammatory glands. In our series the blood picture was not constant, and although we do not feel able to make a diagnosis on it alone it is often quite suggestive.

As regards treatment, radium and the x-rays have a distinct beneficial effect, radium being of more value than the x-ray. With treatment, the glands diminish in size, and the general condition improves. The relation between the treatment and the improvement is definite, and is seen in from one to three weeks after the first application of radium. We have no cases that can be called cured, but the patients are comfortable and able to attend to their duties until nearly the end of the disease. We do not know if the fatal termination has been much postponed, as the cases most benefited may have the chronic form of the disease. The treatments should not be limited to the palpable glands, as is usually the case, but should be directed against the lymphatic areas of the body, the mediastinum, abdomen, etc., from the first.

LYMPHOSARCOMA.

Three cases diagnosed clinically as Hodgkin's disease were found, on a microscopic examination of a gland removed, to be lymphosarcoma. Clinically, we see no way to differentiate these cases from Hodgkin's disease. In two cases the lymphocyte count was high, although the white count was not increased. It would have been interesting to have examined several glands, removed at different times from these cases, but it was not possible. One case came to autopsy, and examination of many of the glands all gave the same microscopic picture (Case 27).

The cases in detail are as follows:

Case 20. Female, 23 years old. Tumor of right side of neck for 6 months. No known etiology. Examination: A well-developed and nourished woman. There is an oval tumor in the right side of the neck just above the clavicle 3 ins. in greatest diameter, which is freely movable. Above and below this are many freely movable enlarged glands. Many enlarged glands present in the left side of the neck, and both groins. No glands palpable in the axillae. Teeth and tonsils not remarkable. Chest normal. Spleen and liver not enlarged. Blood pressure, 90. Differential count—see table.

The patient received two treatments with radium in two weeks, followed by a marked diminution in the size of the glands.

The patient did not return, but was seen one year later. At that time there was a mass of discrete glands in the right side of the neck, none in the left. The inguinal glands and those in the right axilla were also enlarged. Otherwise she seemed well. She had been married and had a baby four months old.

Microscopic examination of gland removed from neck. Capsule not infiltrated. The normal arrangement of a lymph node can be distinguished in places. The cells are of the lymphoid type but rather large, and there are many mitotic figures. There are no endothelial or giant cells.

Case 27. Male, 64 years old. A large tumor of the right side of the neck was removed three years ago, but returned three months ago. Since then it has varied in size and at times almost disappeared. The tumor in the neck first appeared after a severe cold in the head. (The patient was very stupid when admitted, and a history was obtained with difficulty.) Examination: Emaciated, very sick elderly man. Large masses of large, freely movable glands in both sides of the neck, axillae and groins. A tumor under the skin over the occiput the size of a grape fruit and a smaller one of the left eyelid. No evidence of enlarged mediastinal or abdominal glands. Spleen not felt. Considerable ascites and edema of the skin over the abdomen and of the lower extremities. Urine,—of chronic nephritis. Blood—see table. Temperature subnormal during stay in hospital. Patient failed and died two weeks after admission to the hospital.

Autopsy: Large mass of discrete glands in the left side of the neck. In the right side of the neck was an infiltrating tumor. There was also a tumor over the occiput and in the eyelid. Masses of discrete enlarged glands in both axillae and groins. The pancreas was imbedded in a mass of enlarged glands which extended down the aorta to the pelvis. There was a chain of glands on each side of the manubrium and a large tumor mass in the mediastinum. Liver and spleen normal.

Microscopic examination was made of many of the glands, but all presented the same picture. No normal arrangement of a lymph gland could be distinguished. The glands were composed of small lymphocytes, some of which appeared to be undergoing mitosis, separated by fine bands of fibrous tissue. There were many thin-walled blood vessels. The nuclei of a few of the cells were slightly vesicular in character. No endothelial cells were seen. In places there were clumps of eosinophiles.

Case 29. Male, six years old. One year ago, without cause, a tumor appeared on the left side of the neck, which slowly increased in size. No pain or other symptoms. The tumor was removed one month before entrance. Examination: Poorly nourished small boy. There was an operation scar extending from the mastoid process to the clavicle on the left side of the neck. A few hard, movable glands could be felt in the region of the scar. No glandular enlargement elsewhere in the body. Chest and abdomen negative. Urine normal. Blood pressure, 80. Blood—see table.

The patient has received six radium treatments to date. The small glands have disappeared and the general condition has much improved. An indefinite thickening can be felt, however, behind the clavicle extending down into the mediastinum.

Microscopic examination of the tumor removed. The section showed a very cellular tumor, composed chiefly of small lymphoid cells, and cells, somewhat larger, but of the lymphoid type. These latter had slightly vesicular nuclei. The cytoplasm was poorly marked. The section was traversed by few fine fibrous trabeculae, and about these a few larger cells of the endothelial type were seen.

	Case 20		Case 27	Case 29
	Nov. '15	Oct., '16	Apr., '16	Sept., '16
Polymorphonuclear neutrophiles	80	67	37	50
Lymphocytes	10	15	53	37
Large mononuclear	..	..	4	10
Basophiles	..	7	..	1
Eosinophiles	1	4	2	..
Transitional	8	7	22	..
Immature	..	..	..	..
Mast cells	1	..	2	2
			Died Apr., '16	Died Mar., '17
Reds	3,504,000		3,320,000	
Whites	8,600	10,000	10,000	
Hgb.	80%		60%	

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THE PETERSHAM PLAN.[*]

By William R. Woodbury, M.D., Rochester, N. Y.

Certain facts now stand generally accepted. These facts are: That defective teeth and neglected mouths fill a large place among the physical defects of growing children—and with grownups, too; that neglect to bestow regular care upon the teeth and mouth brings physical disaster; and that mouth hygiene holds a place of vital importance in the life of every individual and of every community.

Each new survey carefully made and accurately recorded adds corroborative evidence in support of these facts. In May, 1915, the United States Public Health Service completed a sanitary and medical survey of the rural schools of Porter County, Indiana. The survey was undertaken on request of the Indiana State Board of Health, and the health and school officials of Porter County, "because of the recognized importance of school hygiene to public health." This investigation included a sanitary survey of school locations and buildings, a study of the physical fitness of rural school children, and mental tests of these children. In June, 1916, a report of the survey, prepared by direction of the Surgeon General, was published as a United States Public Health Bulletin.[†] The report introduces itself thus: "On the basis of the results obtained, recommendations were made to the health and school authorities of Porter County. It is believed that many of these are of general applicability, and they are, therefore, included in the following report of the results obtained in this investigation." The generally common belief that a greater number of rural children suffer from physical defects than is the case in cities, because of the greater and more generous medical opportunities and privileges open to the latter, was not verified. "When compared with the reports of inspections made in urban communities, the results of this survey do not confirm this belief. The fact remains, however, that an undue number of the children in rural schools are found suffering from the results of misuse of the special senses and from diseases of these organs which require the services of specialists, unfortunately denied in great measure to the larger part of the general population."

In the text of this report, and following a table which gives in detail physical defects found in medical examination of 2,451 children attending the rural schools of Porter County, is the following statement on oral hygiene: "The results of these examinations show the necessity of greater care of children's teeth in rural communities. Especially is this true of deciduous, the so-called 'milk' or temporary teeth. These should be preserved as long as possible. When the temporary teeth are lost too early or at too long an interval before the eruption of the permanent teeth, shortening of the jaw takes place, and the permanent teeth erupt in an irregular manner. The child should therefore be trained in the use of the toothbrush at an early age. The undue number of children who never used the toothbrush, as revealed by these examinations, the still greater number who used it only occasionally, and the failure to provide for dental service in case of the younger children, call for greater attention on the part of the parents for the protection of the physical and mental fitness of their offspring."

Defective teeth were found to be the major physical defect in the Porter County rural school children; it leads by a wide margin all other defects. Seven hundred and forty-nine (60 per cent.) of the boys, and six hundred and thirty-seven (50 per cent.) of the girls had some form of dental defect. Two or more defective teeth are recorded in 54.5 per cent. of the boys, and 44.2 per cent. of the girls. The highest percentages of defective teeth were observed from the fifth to the eleventh years. Two or more missing teeth also gave the highest percentage in children between the fifth and eleventh years; 28 per cent. in the fifth year and growing into 45.5 per cent. by the eighth year for the boys, 25.8 per cent. in the fifth year and increasing in the seventh year to 37.5 per cent. for the girls. During the period when the deciduous teeth should be doing their work—every temporary tooth sound and in its appointed place doing its full share of the work of sustaining sound nutrition—the greatest number of both defective and missing teeth are recorded. Malocclusion was "observed in marked degree in 4.8 per cent. of all the children examined." The extent to which dental correction had been practised was "slight" up to the eighth year. Only 14.1 per cent. of the boys and 19.7 per cent. of the girls had received any form of dental attention. Daily use of the toothbrush was acknowledged by 13.9 per cent. of the boys and 40.9 per cent. of the girls.

Of the 2,451 rural school children studied during the Porter County survey there was an almost equal distribution of the sexes—1,253 were boys, and 1,235 were girls.

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[*] Given before the Tenth Congress of the American School Hygiene Association at Albany, New York, June, 1917.

[†] Public Health Bulletin No. 77, June, 1916. Rural School Examination, including Physical and Mental Status of School Children in Porter County, Indiana. United States Public Health Service, Washington, D. C.

AGE DISTRIBUTION BY SEX AND ONE YEAR AGE PERIODS.*

AGE IN YEARS	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Boys	25	79	136	121	127	125	110	125	116	112	74	49	20	7	6	2	2
Girls	31	89	104	118	135	127	115	128	109	91	67	50	28	17	5	1	0

* Table III, Public Health Bulletin No. 77.

The total number of physical defects found among the boys was 2,228; among the girls 1,785. Both the boys' and girls' physical defects totaled 4,013.

In the following table are listed those of the physical defects of which the number of each one reported was twenty-five or more:—

	BOYS	GIRLS	TOTAL
Hearing defective	392	348	740
Nose and throat:			
Adenoids	166	122	288
Pharyngitis, chronic hypertrophic	16	31	47
Tonsils:			
Enlarged	89	106	195
Requiring surgical treatment	106	84	190
Spinal curvature; functional	25	11	36
Vision defective	592	550	1142
Teeth defective	749	637	1386

Based on the Indiana Survey the report draws this conclusion:—"The large number of children presenting physical defects of such gravity as to demand specialized medical and surgical attention is an evidence of the need of medical supervision of the school children of the county, in the interests of the child's educational advancement and for the protection of community health."

These examinations and the results recorded are representative of the youthful population not only of Porter County, but of rural communities everywhere. The delicate physical and mental adjustments of children are much more easily disordered than is the case with adults. Minor physical defects, which ordinarily work no noticeable damages upon a grown person, may prevent normal physical and mental growth of the child. Defects of hearing and vision, adenoids, enlarged tonsils, nutritional disturbances, malnutrition, and defective teeth react injuriously on both the physical and mental development throughout all the years of childhood. Upon the remote damages foreshadowed it is not necessary to dwell; but they come plainly into view. To the mouth—to neglected mouths, decayed teeth, and gum abscesses can be traced 20 per cent. of all diseases.

Education is something more than imparting didactic instruction. Giving to the child the foundations of sound physical and mental health, and helping him build for himself a strong physical house which will withstand wear and use is equally important; it is likewise a duty demanded of parents and school authorities. The educator is vitally interested in the physical development and perfection of the school child. Definite knowledge of the physical condition and defects of school children is of value in determining and removing unhealthful influences and conditions in season; and when physical defects cannot be corrected, but must needs be carried along, the educator is better able to adapt mental instruction to physical handicaps as each individual child requires. Every manufacturer knows that however perfect his organization and its machinery, if material that goes into it is bad he turns out "seconds"; and the manufacturer has the advantage of school people in that he can put his goods on the market and label them "seconds." But they are not to his credit; it is not good business. No more is it to the credit of school people to work with poor material; at least not to try to eliminate the major physical defects in the raw material offered them.

Public Health Bulletin No. 77 is noteworthy, and in two particular ways: It records the first complete physical survey of a large and representative number of rural school children; the principal industry of Porter County is agriculture, and the survey included children attending 76 rural schools. Secondly, it stands as unquestioned authority as to the existence of facts which demand recognition from parents, and school and health authorities. With these facts concerning rural school children,—of the 30,000,000 children in the United States, three-fifths, or 18,000,000, are rural children,—with their pressing needs emphasized now as never before; and with these vital needs calling for prompt attention and treatment, an effort to put ourselves right with our duty should be shaped into action. Neither excuse nor reason stands valid against prompt action.

For myself, and for those of us who, a few years ago, recognized this duty and began to call for a new education in mouth hygiene, I wish to express a discerning appreciation of the value of the Porter County Survey. It brings substantial aid for the organization of countrywide intelligent public sentiment into the upgrowth of active effort for helping rural children make fullest use of their rights for healthful living. A recent warning against bodily decline—a warning by a master of facts and figures about the health of Americans, the Conservation Commissioner of the Equitable Life Assurance Society—states, in visualizing the "Physical American":—"His teeth put up a good front, but they need attention. Lack of professional care and of exercise due to the increase in soft, unresisting foods has impaired the health of both the teeth and gums. His digestive organs have been given so many new and arduous duties to which they were not trained that they are showing signs of rebellion. He could detect and head off these troubles if he would go to his doctor for an occasional examination." The mortality rate from the wear and tear of life is gaining too fast. Low-powered or substandard men and women —and children—are increasing in number. To check the vital waste—the waste of national vitality—is an imperative national duty. The median age at death of the American people is about 43 years.

In Petersham, an agricultural community in Massachusetts, a practical plan has been inaugurated to give its school children dental service. The immediate needs of such service are no greater in this country town than in hundreds of others throughout the country. But this Massachusetts town is convinced of its needs; and it is convinced, too, that the small amount of money required to equip and maintain a service which provides for the care of its school children's teeth and mouths is money wisely used. Petersham thus puts itself on record as the first rural community to organize a town dental clinic.

Ten years ago there began, in Boston, an upgrowing of an appreciation of what a clean whole mouth, with a full complement of sound natural teeth, means. At first accepted as theory-reasonable, it grew into being taken as worthy of practical consideration. Each successive year developed a growing intelligent appreciation with a gradually widening company of supporters—of those who gave their support and efforts to promote mouth hygiene. An elightening progress was being upbuilt, and steadily, and always through public opinion which continually was strengthening itself.

Facts as to the condition of children's mouths —and as they are—facts which should be faced squarely—were gathered. All the physical data assembled and recorded lead to a single conclusion: In every community opportunity for professional dental care of children should be provided. Rare was the child who did not have one or more decaying or missing teeth, or both —who did not need prompt dental attention. Large numbers of children were found everywhere to be suffereing from mouth defects of such gravity as to call for immediate attention. Much sickness, many diseases, frequent absence from school and poor school-work were discovered to be due directly to neglected teeth and mouths. From the same causes came disordered eyes, ears, nose and throat; and not infrequently infectious diseases, including tuberculosis, were invited and "carried" by neglected mouths. Out of 118,781 public school pupils in Boston examined, 100,236, about 84 per cent., of the defects found were those originating about the mouth, 51,340, about 66 per cent., being dental defects. Nutrition and normal growth and development are being interfered with continuously, because the mouth cannot do its full share of the work which is demanded to maintain sound body-health.

These facts, and the story of the many added perils which lie across the path of growing children who do not have proper and timely dental care, are not new. They have been told many times, and need no further telling now. Everyone knows, too, how within these few years the new education in mouth hygiene has developed; and how it is beginning to find its place in school and community life. It is surprising that decay and abscesses in the mouth, which were hidden from sight, have been so calmly ignored and left to themselves to develop to the full their evil work. Let an abscess but appear anywhere else in or upon the body than in the mouth, and straightway, without delay, a physician is seen, and prompt attention is given to it.

Dental attention is now provided in public schools in the larger cities, and in many urban communities. Hospitals and dispensaries now provide dental service, and dentists are a part of their working staffs. In Boston a noble and unique institution—the first of its kind in the world—has been built, and equipped and endowed with princely generosity, The Forsyth Dental Infirmary for Children. A generous giver and benefactor to humanity has given to Rochester, New York, a similar institution, likewise with a munificent endowment—The Rochester Dental Dispensary. In this wise has enlightening progress been upbuilt, and the vital dental needs of city children been met.

But the rural children—there are 18,000,000 of them in the United States—have no opportunity for dental attention and care. But hope is growing nearer to achievement. Petersham offered favorable soil for good seed. Some of its people had come to know what mouth hygiene means. A native interest had begun to develop; the same kind of interest which requested the Porter County Survey,—"because of the recognized importance of school hygiene to public health."

There is but one right way to lay secure foundations for a community service. Human nature is the same everywhere. Local public opinion has to grow, and develop itself into accepting apparently commonplace facts. Having accepted them, then to shape itself into the action which puts itself right with its duty as the community sees it. Local interest and the encouragment and use of local talent was the foundation upon which the Petersham Plan was upbuilt. A visit was made to Petersham—a preliminary survey. The need of professional dental attention for its school children was being talked about, and sentiment in its favor was growing. There was no dentist, either settled or visiting, in the town. Athol, the nearest adjoining town, and nine miles distant, had one dentist. Neither a railroad nor trolley-line passed through Petersham. The chairman of the town school committee was heartily in favor of the town fulfilling its duty. Need of professional dental attention for the school children was recognized by the school superintendent; he favored the plan, and urged the town not to postpone performing this duty. One of the village physicians recognized its need; and he was helping promote sentiment in its favor; he was giving it hearty support. The seed was growing.

In October, 1916, the writer (a medical man) and a Boston dentist were invited to speak in the Town Hall. Mouth Hygiene holds equal interest to the physician and the dentist. A physician who would do his full duty to his patients and to the community must realize what neglected and diseased teeth and mouths mean. He should always know first-hand what condition the teeth and mouth are in; and whenever their condition is hostile to whatever course he may elect to follow, he should see to it, and promptly, that they are made right. Not infrequently diseases are stubborn and refuse to yield when the physician and dentist do not work together.

The audience which filled the Town Hall—the town fathers and mothers, school children, the school and health authorities—was convincing proof of the growing public sentiment. The "meeting" was a success; and from that time on the active work of organizing the Petersham Plan moved forward. To the townspeople of Petersham was lent the organization of the Massachusetts Dental Hygiene Council. In a visit to Petersham the president of the council made a careful survey. Arrangements were made for preliminary examination of the school children. These examinations were carefully made by a skilled and experienced dentist; the condition and defects found were recorded; and the expense of the equipment needed and of the work required to be done was estimated. At a town meeting on February 5, 1917, a report was made upon the preliminary survey, and the Town voted $200 for dental care of its school children. Two and seven-tenths (2.7) per cent. of the Petersham school children examined have mouths with no evident defects. The remainder, ninety-seven and three-tenths (97.3) per cent., were found to be defective.

Money for the purchase of the equipment was contributed by "summer" and "year-round" townspeople. The equipment and the clinic were installed in the high school building. Through the coöperation of the Forsyth Dental Infirmary for Children, in Boston, a town school dentist was secured—an operator with previous experience in this special field of work. Before the work of the school clinic began, many of the pupils in the town high school began, of their own initiative, seeking dental treatment of the nearest dentist—nine miles distant. Several of the parents asked to have the dentist, who was coming to do the school-work, work for them; and they volunteered to pay him as they would any dentist. These parents know they need professional care, too; and the time and expense demanded, along with the loss of days of work, in driving to another town to a dentist, means much to them.

On April 2, 1917, the Petersham town clinic was opened. The town pays the operating expenses. Each patient treated is charged a nominal sum an hour for dental work; and a small charge is made for material used. Quite 50 per cent. of the town school children had never been to a dentist. Some of those who made their first visit to the dentist's chair were eighteen years old. The chairman of the School Committee says: "The plan has met with great success, and people are wondering how we are to get along without a dentist in town. The school dentist has been called nights and Sundays to fix toothaches and do dental work for the parents and townspeople. He has been able to do quite a lot of outside work—in fact, about all that time could be found to do."

Petersham was good soil. And now neighboring towns are developing a new interest in mouth hygiene. They are beginning to recognize the importance of school hygiene to public health. The town of Hardwick, an adjacent agricultural town and one of the three towns sharing a school superintendent with Petersham, asks for a lecture on mouth hygiene. Our hope is that the work started at Petersham will extend to all rural communities—and urban, too, —where such work is needed, which means "all places where human beings reside."

A practical working plan—as is the Petersham Plan—can be adopted in every rural community. The facts herein given need no further corroboration. Money and time spent now in seeking proof and in experiment are wasted. With first a careful study of local conditions and a little encouragement to help in upbuilding local public sentiment, and with a small expenditure of money,—which will buy large returns,—a practical working and self-supporting school dental clinic can be organized and maintained in every community; which leads to the adoption of another community need,— the rural school nurse.

Three years ago the Dental Hygiene Council of Massachusetts prepared a Standard Lecture on Mouth Hygiene—an illustrated lecture on "The Care and Use of the Human Mouth,"—which presents in an attractive and interesting form the facts which the public needs to know. For a nominal rental fee a speaker may secure all that is needed for an interesting and instructive discourse—everything except the speaking voice. The manuscript and lantern slides are rented to any properly qualified person who is desirous to present the matter in public. To date this Standard Lecture has been presented before more than half a million people.

A new field of work, and one for which the greatest need exists, is being undertaken by the Massachusetts Council. The public dental clinic, to be successful, must be conducted with economy as to cost and with an increase of efficiency and service. Standardization of the dental clinic, in simple terms, is the adoption of definite or standard rules of organization, equipment, operative procedure, and general management. It is the purpose and intent of the

Dental Hygiene Council of Massachusetts to carry out the full solution of this important undertaking—to meet the very evident demand which exists for the standardized dental clinic.

The Petersham Clinic is the first rural dental clinic to be put into operation in this country. It is a standard dental clinic of the rural type. The Petersham Plan is an unqualified success. Rural children need dental attention; opportunity to get it should not be withheld from them. Withholding it works unnecessary hardships to those whom we wish most to protect.

TRI-NITRO-TOLUENE POISONING IN MASSACHUSETTS.

By Thomas F. Harrington, M.D., Boston,
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Industrial poisoning by the different derivatives of benzene compounds of the coal-tar group of chemicals[*] has loomed into prominence in this country during the past two years chiefly because of the use of these compounds in the manufacture of high explosives and dyestuffs, as well as because of their use as motor fuel. Among the cases of industrial poisoning due to benzene derivatives reported to the State Board of Labor and Industries since November, 1915, there were 17 cases with 4 deaths, attributed to tri-nitro-toluene. Before taking up the consideration of these cases it may be of interest to set forth some of the fundamentals of industrial poisoning by chemical gases, fumes and dust.

CLASSIFICATION.

No satisfactory classification of industrial poisons, nor of occupational diseases attributed to such, has received general adoption. The difficulty of agreeing to any fixed classification is apparent when we realize the variations in the relative toxicity of the various compounds and of the various processes in which they are used. As a result of dilution with air, most industrial poisons can be absorbed only in very small doses, and yet, notwithstanding this, some are so much more injurious than others that the symptoms described may give no idea of the relative dangers of one or the other. Again, in regard to many substances the term "industrial poison" is a misnomer until the amount absorbed reaches a certain point, *i.e.*, beyond the powers of the individual to eliminate from his system the poison taken in. Individual susceptibility or immunity plays a very important part in this group of industrial poisons. Many poisons affect several organs at the same time, hence any classification based upon such a basis of action would be cumbersome and confusing. However, a classification, based upon the predominating action of the poison, groups the problem quite arbitrarily as follows:

(1) Irritating to skin or mucous membrane, *e.g.*, acids and alkalis;

(2) Destruction to the normal character of the red blood cells, *e.g.*, aromatic series of organic poison—nitro and amido derivative of benzene, arseniuretted hydrogen gas, carbon monoxid and cyanid compound;

(3) Affecting the brain and nervous system, *e.g.*, carbon compounds and carbon bi-sulphid.

Another classification of not only fumes and gases, but of industrial poisons in general, is that founded upon a chemical basis, *i.e.*, organic and inorganic, with a subdivision of the organic into (*a*) the unsaturated carbon compounds, (*b*) the aromatic series; and the inorganic into (*a*) non-metallic, (*b*) metallic.

The nitro- and the amido-derivatives of benzene, *e.g.*, nitro-benzol, dinitro-benzol, paranitrochlorobenzene, anilin oil, paranitranilin, dinitrotoluene and tri-nitro-toluene act mainly on the blood, converting the hemoglobin of the red blood cells into methemoglobin and leading to solution of the red cells. While both nitro- and the amido-derivatives resemble each other greatly in their action, nevertheless, there is a distinction in their action that affects markedly the symptoms produced by each. Both are readily absorbed in the form of fumes or dust by the skin and lungs. Taken by the mouth, either produces rapid poisoning. The pathology in each case explains readily the symptoms: the nitro-derivatives dissolve the red cells and the freed hemoglobin reaches the liver, where it is converted into bile coloring matter. The bile becomes more inspissated, hence jaundice. The hemoglobin remaining in the blood becomes converted into methemoglobin, which gives to the workers the ashen gray or cyanotic (bluish) color of the lips and complexion that characterizes this group of workers. The power to take up oxygen is gradually lost, resulting in the development of dyspnea or symptoms of air hunger, nausea, vomiting, headache, giddiness, severe nervous symptoms, feeling of anxiety and, in severe cases, unconsciousness, lividity and death. The unoxygenated blood sets up irritation of the central nervous system, especially in the medulla, and a comatose condition ultimately ensues. Accompanying this blood change is a rapid, small pulse and feeble heart action, noted by many observers. If the destruction of the red blood cells becomes so rapid or increases so extensively that the liver cannot convert the hemoglobin into bile pigment, some will pass on to be excreted as characteristic darkly colored urine. In contradistinction to the nitro-derivatives, it has been observed quite generally that after absorption of the amido compound (anilin), conversion of hemoglobin into methemoglobin precedes the destruction of the red blood corpuscles. This blood may be found in the urine of anilin workers, but rarely bile pigment; a marked reduction of hemoglobin is characteristic of anilin workers. The blood in either case, *i.e.*, in nitro or in amido, whenever the stage of jaundice or cyanosis has been reached, is chocolate in color and shows bands on the spectrum of methemoglobin, granular degeneration of red cells, alteration in their form and color, and after a few days nucleated red cells marking regenerative changes. Many observers have remarked on the prevalence of tumor of the bladder of men exposed to anilin poisoning.

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[*] Not to be confounded with *benzine* of the petroleum group.

Poison may take place from the initial substance used in the process of manufacture (benzene, toluene, etc.); from the elements or compounds employed in carrying out the reactions (*e.g.*, chlorin, nitric acid, sulphuric acid, arseneous acid, sodium sulphid and sulphuretted hydrogen gas); from intermediate bodies formed (nitro and amido compounds, *e.g.*, nitro-benzol, dinitro-benzol, anilin) and, finally, from the end-products themselves (dyes).

The cases of poisoning by the fumes of tri-nitro-toluene (also known as T.N.T. and toluol, as well as triton or trotyl), reported in this paper, occurred in the manufacture of picric acid and benzol by the nitration of toluene. In this process both nitric and sulphuric acids are used. This manufacturing process was begun in Massachusetts late in the fall of 1915. The first case of poisoning reported occurred in November of that year.

Occupational illness in this group of cases is due chiefly to T.N.T. dust and to the escape of nitrous fumes evolved in the nitration and during the dilution of the T.N.T. waste acids, also from the chlorin and its compounds given off in the manufacturing process.

Symptoms may develop quickly, especially when there is exposure in confined space. These may be—

(1) Persistent cough due to no known cause;
(2) Unaccustomed shortness of breath;
(3) Fatigue, not explained by exertion;
(4) Pain coming on suddenly in legs and feet.

These symptoms may develop in degrees from temporary discomfort, relieved by going into the open air, to convulsions, paralysis and death.

The following cases, taken from the records of the State Board of Labor and Industries, bring out many of the various forms in which industrial T.N.T. poisoning may show itself:

Case 1. (Fatal.) A carpenter, 42 years of age, employed one week in an establishment where the nitrating of toluene was a part of the process of manufacture, was made dizzy from fumes escaping from a duct under which he was at work. A short stay in the open air revived him. Vertigo and dizziness returned when he remounted the staging. He went home and returned to work the next day. On reaching the working platform he was nauseated, vomited, became dizzy and had to be helped out into the open air. He drove two miles in an open car to his home, during which he was exposed to cold, damp November air. Seven hours later he suddenly grew worse, had convulsions, passed into coma and died at 11.45 p.m. Autopsy confirmed death by gas poisoning.

Case 2. (Fatal.) A man, 26 years of age, employed for three months on a nitrator of toluene, reported to the physician on November 4. His symptoms were pallor, dermatitis, general weakness, loss of weight, nausea, cough, palpitation, headache, vertigo, low hemoglobin count. Man left work and after two days' absence appeared to be perfectly well, when suddenly shortness of breath and symptoms of edema of the lungs developed. He died November 10. Death return given as pneumonia due to gas poisoning.

Case 3. (Fatal.) Man, 26 years of age, employed as a laborer about yard of a chemical works, where the nitrating of toluene was being done, on Saturday worked from 6.30 a.m. to 5 p.m.; did not work on Sunday; reported at 6.30 a.m. Monday and soon requested leave of absence on account of nausea, vertigo and loss of muscular power. Returned to his home at seven o'clock in the morning. Fellow workman visited him in the evening and noticed hallucinations, mental confusion, inability to talk coherently. Man was taken to the hospital, where he died at 11.30 p.m. the same day. Autopsy finding: death from tri-nitro-toluene gas.

Case 4. (Fatal.) Man, 43 years of age, employed as a guard about a plant nitrating toluene, was transferred to the nitrating department on February 15, 1916. On the following day, while cleaning the inside of the nitrating tank, he was frequently compelled to go out into the air for relief, because of nausea, dizziness and blurred vision. He worked from 10 a.m. until 2 p.m., walked about one mile to an electric car and rode five miles to his home. Early in the evening he was seized with vertigo, hallucinations, spasms, unconsciousness, and died at two o'clock in the morning. Autopsy findings: edema of lungs due to gas poisoning.

A marked characteristic of the foregoing cases was the delayed onset of fatal symptoms and the long interval of apparent good health between the time of poisoning and the onset of serious symptoms. This late manifestation of toxemia from benzene derivatives is a characteristic feature in this group of industrial poisoning. These cases also occurred in cold weather, during which there was much exposure after the onset of the first acute symptoms. Most authors emphasize the necessity of safeguarding against cold, men who have been exposed to gases and fumes. Of this group of poisons, each of the cases described showed the characteristic manifestations of red-cell destruction and, consequently, oxygen starvation, especially of the brain and nervous system. Post-mortem findings showed marked blood destruction and organic congestion.

The following non-fatal cases of T.N.T. poisoning are quite typical of this group:

Case 1. Man, 43 years of age, employed with a fellow workman (Case 3) in cleaning the inside of a nitrating tank, was overcome by fumes, rendering him unconscious. He was removed to the outer air and was resuscitated by artificial respiration with the use of a lung motor. He walked three miles for an electric car and rode seven miles to his home. He was apparently fully recovered from the "gassing." Next morning at two o'clock he was awakened suddenly with dyspnea, suffocation, chills, pain in left chest, dizziness and marked muscular prostration. He also had cyanosis and a thick, sticky, brownish expectoration, slight fever, cloudy urine, dark, sticky ejections, crepitant râles at base of both lungs. Diagnosis: edema of lungs. Made a slow recovery.

CASE 2. Man, 30 years of age, had worked in T.N.T. department for six weeks. During past week had cough, irritation of throat and frequent attacks of nausea and dizziness. Had lost fourteen pounds in weight in six weeks. Found he was not able to do work as formerly, easily fatigued, much muscular weakness; face showed ashen hue. Transferred to outside work, fully recovered.

CASE 3. Man, 24 years of age, an electrician, was sent to a chemical works to make repairs in T.N.T. department. After fifteen days' work he was reported as sallow, nauseated, general weakness, vomiting, cough, rapid pulse, headache, vertigo, unable to continue work because of general muscular weakness and constant recurrence of foregoing symptoms.

CASE 4. Man, 26 years of age, employed one month as mixer in T.N.T. department, was "gassed" by escape from leaky pipes. Felt slight discomfort, transferred to outdoor work. Two days later was seized suddenly with vertigo, headache, nausea, vomiting, loss of power, cough; not able to continue work because of loss of muscular power.

CASE 5. Man, 24 years of age, had been working about one month on T. N. T. nitrator; was suddenly overcome on way home when about half a mile from plant. Was unconscious for two days. Convulsions, muscular spasm, loss of power of legs were followed with some muscular wasting. He also had pallor, cyanosis, dyspnea, cough, pulse of 120, vertigo, mental confusion. Convalescence slow. Never fully recovered complete muscular power of legs.

CASE 6. Man, 25 years of age, had worked six weeks as machinist about T.N.T. plant. Suddenly overcome by fumes from nitrating pot overflowing, remained unconscious four hours. Cyanosis, general weakness, dyspnea, pulse rate of 90. On recovering consciousness was troubled frequently with vertigo and marked loss of power of legs; not able to return to work.

CASE 7. Man, 35 years of age, worked as a laborer about T. N. T. plant. At the end of three weeks reported with pallor, general weakness, loss of weight, pulse 90, "looks poorly," hemoglobin 70-80%, easily fatigued, much loss of muscular power; not able to continue work; left employment.

The State Board of Labor and Industries has furnished a set of rules and regulations for safety in the manufacture of benzene derivatives and explosives.* These rules provide that a "caution" notice be posted in a conspicuous place in all departments where any of the substances are used, setting forth the common name of the poisonous substance and that the substance named is capable of causing poisonous symptoms if precautions are not observed. This notice also sets forth the signs and symptoms of poisoning, viz.: throbbing of blood vessels, giddiness, dizziness, headache, weakness of legs, palpitation of heart, nausea, blueness, cyanosis and unconsciousness.

The first-aid treatment recommended is:

(*a*) Remove poisoned person to the fresh air. Keep him quiet and warm.

(*b*) Do not let person walk home until advised by physician.

(*c*) Use hot coffee as stimulant.

(*d*) If person is unconscious, apply artificial respiration; lungmotor; oxygen inhalation; keep patient warm.

PREVENTION.

(*a*) Avoid dust, fumes and chemical compounds on hands, feet and clothes.

(*b*) Wash hands before eating and after day's work is finished.

(*c*) Do not eat food nor chew tobacco in workroom.

(*d*) Do not wear same clothes in workroom and at home.

(*e*) Use extra protection on hands, feet and clothes while at work on any of the substances mentioned in these regulations.

(*f*) Bathe regularly.

(*g*) Consult a physician if losing color or weight.

(*h*) Do not enter stoves, vats or retorts for repair work unless in the presence of another workman.

(*i*) Have emergency appliances ready for use in all dangerous repair work.

(*j*) Watch for leaky joints in pipes, ducts, valves, etc., carrying the gas or chemical compounds.

SOME OBSERVATIONS ON THE BÁRANY TESTS AS APPLIED TO AVIATORS.

BY H. L. BABCOCK, M.D., BOSTON.

[From the U. S. A. Aviation Station at the Massachusetts Charitable Eye and Ear Infirmary.]

BEFORE beginning the recent nation-wide appeal for men to train for service as aviators, the authorities at Washington, realizing the necessity of sending into the air only men with normal equilibrium, incorporated into the already exacting physical examination, the so-called Bárány methods of examination of the semicircular canals. These tests determine the presence or absence of an intact and normally active static apparatus.

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* Copies may be procured at the office of the Board, 1 Beacon Street, Boston. (Industrial Bulletin No. 11.)

This work was developed by Robert Bárány, a brilliant young otologist of the Vienna school, who, in 1914, was awarded the Nobel Prize for research in medicine. At the beginning of the European War, Bárány enlisted in the Austrian army, and the work was taken up by a small group of otologists in the Medical School of the University of Pennsylvania. Using Bárány's methods, supplemented by the work of the Spanish anatomist, Cajal, and the results of autopsy findings, this group of investigators has been able to bring the methods of examination to a point of marked diagnostic efficiency. The principle underlying them all is this: Movement of the endolymph in the semicircular canals in a given direction stimulates the sensitive hair cells in these canals, and produces definite phenomena. These phenomena are: 1, a twitching of the eyes, or nystagmus, of a certain type; 2, vertigo; 3, so-called "past-pointing"; 4, falling reactions. In a person to be examined, this endolymph is artificially set in motion, either by turning the subject in a smoothly revolving chair, or by douching the ear with hot or cold water. The complete technic of examination has been described in detail in a recent article by Jones and Fisher (*Annals of Otology, Rhinology, and Laryngology*, Vol. xxvi, No. 1) and will not be taken up here.

The tests used for the candidates for aviation are based on the turning reactions only,—the caloric and galvanic reactions being omitted entirely,—as the only object is to determine the integrity of the labyrinth and its tracts, and not for differential diagnosis.

It has been the duty of the writer during the past five months to examine over one thousand candidates by these methods, at the Boston examining station in the Massachusetts Charitable Eye and Ear Infirmary. The chair used is the American modification of the Bárány chair, with two head rests, a foot rest, and a stop pedal. Some facts of interest have been brought to light. The examination adopted for this work is as follows:—

Equilibrium (vestibular). Head tilted forward 30°. Eyes closed. Rotation nystagmus normal 26 seconds, a variation of 10 seconds allowable.

(*a*) *Right:* Applicant to be turned toward his right, 10 turns in exactly 20 seconds, horizontal nystagmus to left for ...... seconds. *Left:* Applicant to be turned toward his left, 10 turns in exactly 20 seconds, horizontal nystagums to right for ...... seconds.

(*b*) *Pointing tests:*

1. Before turning. Right arm ......, left arm ....
2. After turning 10 times in 10 seconds to right. Right arm ....., left arm ......
3. After turning 10 times in 10 seconds to left. Right arm ....., left arm ......

(*c*) *Falling tests:*

1. Turn to right, 5 turns in 10 seconds. Falls to ......
2. Turn to left, 5 turns in 10 seconds. Falls to ......

(*a*) *Nystagmus.* The patient is seated in the chair with head upright, but tilted 30 degrees forward and pressed back firmly against the head rest. Tilting the head forward 30 degrees brings the external semicircular canal exactly in the horizontal plane, and is, therefore, the canal to be stimulated when the candidate is revolved in a horizontal plane. With his eyes closed, he is then turned to the right ten times in twenty seconds. The chair is then suddenly stopped and the candidate told to open his eyes and look straight ahead at some distant point. There should occur a horizontal nystagmus to the left of 26 seconds' duration. The nystagmus is horizontal because nystagmus is always in the plane of the canal stimulated. The movement in this instance is a slow pull of the eyeball to the right, followed by a quick return to the left; the latter being the most noticeable, the entire reaction is called nystagmus to the left. As a matter of fact, the vestibular stimulation has to do only with the slow component, the quick component being "cerebral" and not "brain stem." This has been demonstrated by turning a normal individual under ether and observing only a conjugate deviation in the direction of turning, the eyes always being drawn in the direction of the endolymph movement. The nystagmus, then, is in reality a battle between the purely reflex stimulation from endolymph motion to the eye-muscle nuclei in the pons, and the cerebral attempt to cut down the pull and restore the eyes to their normal position. The duration of this battle varies considerably. While 26 seconds has been found to be a normal average duration, a liberal variation of ten seconds either way is allowable. The rate of movement also varies greatly. In the candidates examined this rate has varied from a movement so rapid and fine as to be almost imperceptible, to a movement of very large amplitude and at a rate of hardly more than one double movement per second. The average, as observed, has been at the rate of 30 to 45 double movements for the first fifteen seconds. The duration of nystagmus is measured by a stop watch. In a similar manner the candidate is turned to the left, although this is practically unnecessary, provided the first turning gave a normal reaction. This is because the reaction following turning to the right is furnished by both horizontal canals combined—one-third from the right and two-thirds from the left (the explanation being that movement of endolymph toward the ampulla gives a stronger reaction than movement away from it). The nystagmus persists a few seconds longer than the vertigo.

(*b*) *Pointing Tests.* These tests are not reflex acts, and require honest and intelligent coöperation between candidate and examiner for their execution. Happily, the applicants for air service have thus far been of sufficiently high grade to render this coöperation easily obtainable. The candidate, sitting in the chair, facing the examiner, closes his eyes and touches the examiner's finger, which is held in front of him. He next raises his arm to a perpendicular position, then lowers the arm, and attempts to find the examiner's finger—first with the right arm, then with the left. The normal individual is always able to find the finger. After turning the candidate to the right ten times in ten seconds, this test is repeated. During the last turn the stop pedal is released in order to lock the chair as it comes into position. This prevents any movement of the chair during the tests, which might offset the past-pointing. By past-pointing is meant the deviation of the candidate's finger to the right or left as he tries to locate that of the examiner. The right arm is tested, then the left, then the right, etc., until he ceases to past-point. In this instance the normal individual will past-point at least three times to the right with each arm. The eyes are kept closed throughout the test. The phenomenon of past-pointing is the result in this case of experimentally produced vertigo. Vertigo is always in the plane of the canal stimulated (in this case, the horizontal), and is always in the direction opposite turning because of the changed relationship of the endolymph movement to body movement, the instant the chair is brought to a sudden stop. This being the case, the candidate feels that he is rapidly turning to the left, while in reality he is sitting motionless. Hence he feels that he is going away from the examiner's finger, and in his effort to come back to it, he past-points to the right. The test is then repeated, turning to the left. At the Boston station the Bárány chair, unfortunately, is in the large room in which the applicants wait. This enables them to familiarize themselves somewhat with the pointing tests and oftentimes clouds the purely sensory reaction desired. In the cases where the candidate overcomes his vertigo and swings in the wrong direction, the writer has observed that failing to touch the desired object, the arm will then swing back in the normal direction. A great variation in the extent of past-pointing has been noted, some men swinging out ninety degrees, while others deviate only a few inches from the examiner's fingers. Also the outward pointing arm almost invariably swings wider than the inward. These variations are probably due to differing degrees of muscular control. If, however, the pointing tests are questionable, the vertigo is measured quantitatively in the following manner: The candidate is turned, with eyes closed, to the right at a uniform speed, and is asked to keep on telling the examiner in what direction he is being turned. Thus he keeps on saying, "to the right, to the right." After ten turns in ten seconds the chair is stopped and immediately he will say, "I am going to the left." The stop watch is started the same instant and kept running as long as the patient thinks he is going to the left. When he says, "I am standing still," the stop watch is stopped and the reading of the duration of the vertigo taken in seconds. In a normal case the duration of the vertigo is approximately twenty-four seconds. The test is performed in a similar way by turning the patient to the left. This test depends on the same physiological stimuli as does the pointing test.

(*c*) *Falling.* The candidate's head is inclined ninety degrees forward and held in place by a head rest. The eyes are closed. He is then turned to the right five times in ten seconds. On stopping, the candidate raises his head and should fall to the right. In placing the head ninety degrees forward, the vertical canals are then in a horizontal plane, and therefore, the endolymph in those canals is set in motion when the chair is rotated. As long as the head is kept in that position the vertigo remains horizontal, but on raising the head to an upright position the vertigo at once becomes vertical (in this case to the left because the endolymph movement was to the right) and the candidate, having the sensation of falling to the left, throws himself to the right in order to correct his supposed abnormal position. The test is then repeated, turning to the left. Great variation, within normal limits, has been noted in connection with this test. Some men entirely lose control of themselves, and would fall from the chair if not supported by the examiner. In others only the slightest sway to the right or left can be directed as the head is raised. Here again voluntary muscular control is a large factor. Occasionally a man will raise his head with no lateral movement whatever, and hold it so for several seconds, when on slightly relaxing his body, the sway will become apparent.

It is a well-known fact that stimulation of sensory nerve-endings may affect the pulse rate. The following is a summary of pulse-rate findings taken immediately before and after turning, on one hundred cases taken at random among the candidates examined:

Average pulse rate per minute before turning	78
Average pulse rate per minute after turning.	87
Average pulse increase per minute..........	9
Lowest pulse rate per minute before turning	58
Highest pulse rate per minute before turning	108
Lowest pulse rate per minute after turning..	60
Highest pulse rate per minute after turning	124

In 80 cases the pulse rate increased after turning.
In 12 cases there was no change.
In 8 cases the pulse was lower after turning.
The greatest increase was from 80 to 116, or 36.
The greatest decrease was from 76 to 66, or 10.

These findings cover a wide range of variation. Taking the general averages, it can be said that in one hundred cases the stimulation to the vestibular portion of the eighth cranial nerve end-organ by fifty revolutions, at varying rates of speed, produced an increase in the rate of heart action of nine beats per minute. Taking the cases separately, they may mean little or nothing. The responsiveness of the pulse rate to mental conditions probably accounts for the eight cases which showed a lowered rate after turning, due to the fact that some of the men approach these tests with considerable apprehension.

A still more interesting and valuable investigation has been suggested by Dr. C. J. Blake,—that of determining the length of time necessary for the organism to regain its normal control of the heart action. Lack of time has made this study impossible.

In a very few cases, an active reflex with the tenth cranial nerve has caused vomiting, especially after stimulation of the vertical canals. In no case has the candidate fainted, although when it is anticipated, he is strapped in the chair.

The writer believes that, by demonstrating an actively normal organ of equilibrium in every prospective aviator, this Government will avoid many costly accidents in the air which otherwise would be unavoidable.

This work is a part of the examination conducted at the Massachusetts Charitable Eye and Ear Infirmary through the kindness of its trustees. The personnel of the physical examining unit consists of Capt. H. P. Cahill, Lieut. J. G. Jennings, Assistants W. J. Harkins, W. I. Wiggin, G. H. Poirier, H. L. Babcock, Mrs. Edward Irwin and Mrs. D. E. Woodbridge.

A STUDY OF SOME PERCENTAGE SOLUTIONS.*

By Theodore J. Bradley, Boston,
Massachusetts College of Pharmacy.

In general, it is impossible to prepare a predetermined volume of a solution of a definite percentage strength, as we cannot know the specific gravity of the solution before it is made. Nevertheless, such solutions are frequently prescribed, and this paper is a report on a study of the problem of preparing them so as to approximate closely the required strength and volume.

Assuming that he knows that percentage solution means that the given number of parts by weight of the chemical are contained in 100 parts by weight of the solution, the thoughtless dispenser who has a call for a fluid ounce of a percentage solution will most often calculate the required percentage of 480 grains, assuming that this is the weight of the finished solution, which is seldom the case. A more careful worker will calculate the required percentage of 455, or thereabouts, assuming that the finished solution weighs the same as one fluid ounce of water, which is seldom quite true. Either of these men will weigh the calculated amount of the chemical, introduce it into a graduate or an ounce bottle and add sufficient of the solvent to make one fluid ounce.

Remembering that it is practically impossible to make an absolutely accurate solution of any strength, these methods are sufficiently accurate for weak solutions, say up to 5% strength, perhaps even up to 10% strength, but such methods will not do for strong solutions the specific gravities of which are markedly greater than that of water. In various parts of the country, strong solutions of silver nitrate, argyrol, potassium iodide and other chemicals are frequently prescribed, and the druggist who is asked for a 50% solution, and weighs 240 grains of a chemical, adding enough water to make a fluid ounce, will dispense a solution of about 35% strength. If the physician calls for a percentage solution, it is not safe or wise to assume that he means a 50 weight to volume solution, as in the foregoing examples.

It is entirely correct to dispense percentage solutions entirely by weight, but this is contrary to American custom, and not many pharmacists will do it.

An indefinite volume of a correct percentage solution can be made by dissolving as many parts of the chemical as the percentage required in sufficient water to make 100 parts by weight of the solution, and this method can be used to prepare a volume greater than any given number of fluid ounces, as in the following example:

To dispense 2 fluid ounces of a 25% solution of silver nitrate.
100 — 25=75 parts of water in 100 parts of the solution.
455×2=910 grains, weight of two fluid ounces of water.
75 : 25=910 : x=303 grains, weight of silver nitrate to be added to 2 fluid ounces of water.
(Notice that 2 fluid ounces of water are to be used; *not* enough water to make 2 fluid ounces.)

While this method is accurate, it is wasteful, as the surplus is generally thrown away, or it is impracticable in requiring the preparation of unstable stock solutions.

In studying this question percentage solutions of quinine bisulphate, an alkaloid of average density, and of silver nitrate, a heavy chemical, were made and their specific gravities taken. From the results the following tables were constructed:

Percentage Solutions of Quinine Bisulphate.

Strength	Specific Gravity at 25° C.	Weight of 1 fl. oz. at 25° C. in Grains.	Grains of Salt in 1 fl. oz.
0%	1.000	454.6	0.0
1%	1.003	456.0	4.6
2%	1.006	457.3	9.1
3%	1.008	458.2	13.7
4%	1.010	459.1	18.4
5%	1.013	460.5	23.0
6%	1.016	461.9	27.7
8%	1.021	464.1	37.1
10%	1.026	466.4	46.6

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* A paper presented at the 1917 meeting of the American Pharmaceutical Association

PERCENTAGE SOLUTIONS OF SILVER NITRATE.

Strength	Specific Gravity at 25° C.	Weight of 1 Fl. Oz. at 25° C. in Grains.	Grains of Silver Nitrate in 1 Fl. Oz.
0%	1.000	454.6	0.0
1%	1.009	458.7	4.6
2%	1.017	462.0	9.2
3%	1.025	466.0	14.0
4%	1.034	470.0	18.8
5%	1.043	474.1	23.7
6%	1.052	478.2	28.7
8%	1.071	486.9	39.0
10%	1.096	498.2	49.8
12%	1.128	512.8	61.5
15%	1.162	528.2	79.2
20%	1.216	552.8	110.6
25%	1.276	580.1	145.0
50%	1.688	768.4	393.2

An examination of these tables will show that the common methods of dispensing are approximately correct for both solutions up to about 5%, and for the alkaloidal solution up to about 10%, but that solutions made by such methods are grossly inaccurate for strong solutions of heavy chemicals. The last column of the second table can be used for preparing percentage solutions of silver nitrate, multiplying the quantity for any required number of fluid ounces, and adding sufficient distilled water to make the required volume.

This is only a preliminary paper on the subject, and it is the writer's intention to extend the tables to include other chemicals prescribed in percentage solutions, and to endeavor to calculate average weights per fluid ounce for solutions of different strengths and of different chemicals. Suggestions for chemicals to be included will be gratefully received.

Book Reviews.

An Original Hypothesis of the Origin of Life. By MRS. M. A. MOORE-BENTLEY. Published by Author, 1917. Selling Agent, J. L. Hammett and Company, Boston.

This book of about two hundred pages is an annunciation of a new hypothesis of the origin of life and the evolution of intellect. The author claims absolute originality of idea, if not theory, and disputes many of the theories of the evolution of life and the evolution of intellect. Her ideas are presented in fifteen chapters, illustrated by forty-five original drawings.

The Practical Medicine Series. Vol. 3. The Eye, Ear, Nose and Throat. Edited by CASEY A. WOOD, C.M., M.D., D.C.L.; ALBERT H. ANDREWS, M.D.; GEORGE E. SHAMBAUGH, M.D.

This book of 372 pages is one of a series of ten, covering the field of medicine and surgery. This volume is on the eye, ear, and throat, and gives the progress in these branches for a year. This number has a good deal bearing on the military surgery of the eye, and covers the work on eye, ear, nose and throat for the year 1916.

The Baby's Food. By ISAAC A. ABT, M.D., Professor of Diseases of Children in the Northwestern University Medical School, Chicago. 12mo of 143 pages. Philadelphia and London. W. B. Saunders Company. 1917.

This little book is simply a collection of very careful recipes for the preparation of the foods most commonly used for babies and young children. The directions given are most minute and very plain. We know of no other book exactly like it. It should prove most valuable to mothers, nurses and physicians.

The Surgical Clinics of Chicago. June, 1917. Vol. I, No. 3. With illustrations. Published bi-monthly. Philadelphia and London: W. B. Saunders Company.

The contributors to the Surgical Clinics of Chicago for June are Drs. E. Wyllys Andrews, Carl Beck, Frederic A. Besley, Arthur Dean Bevan, James T. Case, Carey Culbertson, Arthur H. Curtis, Vernon C. David, Carl Braden Davis, George G. Davis, Daniel N. Eisendrath, Albert Edward Halstead, N. Sproat Heaney, Lewis L. McArthur, Albert J. Ochsner, Charles Aubrey Parker, Nelson Mortimer Percy, D. B. Phemister, John Lincoln Porter, Kellogg Speed and Thomas J. Watkins.

There are twenty-five monographs of varying length.

The article by Bevan, upon esophageal diverticulum, is the best brief statement of this condition and its treatment, that we have seen. He writes also an excellent chapter upon diaphragmatic hernia.

Wyllys Andrews describes his method of operative relief for varicocele in a brief and well-illustrated chapter; and Halstead outlines an interesting technic in the operative treatment of hydrocephalus. Phemister tells of a simple and effective method of reconstructing the hepatic duct. The other articles are well worth reading. Vol. No. 3 compares favorably with its predecessors.

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A BROADER CONCEPTION OF INSANITY.

PERHAPS nowhere is the line between health and disease so difficult to draw as in diseases of the mind. A great deal of this difficulty lies purely in the lack of knowledge on the whole subject. More of it is due to the fact that although there may be very patent mental disturbances, even following definite diagnostic requirements, the disturbance is not sufficient to make the individual a menace or a burden to society. One must hesitate on any other grounds to make a clear-cut diagnosis of insanity. Yet clinically the diagnosis of insanity can be made with less hurt to the conscience than otherwise, because very often clinical diagnoses, in so far as the mind is concerned, are merely academic expressions. The serious side of this question, however, arises in law. The law lays down certain requirements before it will absolve an insane person from responsibility for his act, and these are the requirements that the psychiatrist must reconcile with his own. The "rule in McNaughton's case" is still law at the present time,—that to be free from responsibility an individual must not "know the nature and the quality of the act he was doing, or if he did know it, he did not know that he was doing what was wrong." Medicine inclines to hold that once the fact of an insanity is established the individual is no longer responsible. Aside from philosophic considerations of human responsibility, there is no doubt that there cannot exist in the body any pathological change without influencing the whole body and the action of that body. Yet this same influence must logically apply to somatic disease as to mental. There is no doubt that the rule in McNaughton's case applies in every classic mental disease where an individual must be held under restraint for his own or for society's sake. Nevertheless, it must be conceded that there are many distinctly insane who never run counter to society, perhaps from lack of provocation or because the restraining influence of their environment or previous training and education is stronger than the compulsion of their mental disturbance. And without overt action or burden, definite statements of insanity are unscientific dogma until, at least, more is known on the subject. There is quite as much difference of opinion as to the presence of tuberculosis, heart disease, etc., in a certain individual as of insanity, yet these very diseases do not always incapacitate an individual, nor even necessarily render his efficiency less, any more than they do in mental disease. There are many individuals, for example, who conform to all the earmarks of melancholia—the so-called "glooms"—who get on very well in society, although an examination by any psychiatrist might pronounce them distinctly psychopathic. They are not practically insane as long as they take their own place in society, are not a burden on it, and contribute a little to the common welfare. The same may be said of certain manic types. They always live in a certain heightened mental state, always voluble, excited and elated. They are real manics. They might be under restraint except for the degree, for the evenness of their condition and for the fact that they are perhaps never really sufficiently crossed to bring an unusual outbreak. Very often they are the clowns, the entertainers and the like, and general favorites. The laity recognize them merely as types, and they get along in their own way—

as does nearly every one else. Some of the geniuses of society may perhaps be found among them. Indeed, if we are looking for mere symptoms of insanity, there are many credited to the insane that are in full bloom in those considered normal. In order to make out insanity from symptoms it is the *ensemble* in action that constitutes it. People with depressions, fears, excitations, notions, etc., are met with in all walks of life. The laity call them queer or peculiar—and that is perhaps the worst that can really be said of them. It is true that many of them need only sufficient provocation to change them from potentials to actuals.

When we pass from symptoms of insanity to actual insanities, such as dementia precox, paranoia, etc., we find the same difficulty of determination. Not all cases of dementia precox are unable to take care of themselves. They may fill many positions of trust and responsibility. The disease may be so mild in them or the progress so slow that a lifetime is too short to bring the disease out fully. Because of the wealth of their imagination, colossal egotism, and so-called "push" they may reach advanced positions,—positions to which one with more balance, poise and restraint could not attain. With many paranoiacs the specific delusion and associated symptoms may never be more than mere hobby, and certainly not more harmful. Provocation for overt action may be so mild as never to merit resentment, and therefore give no cause for interference.

It does not follow, because a person is found, perhaps quite by chance, to be basically insane, that he is as a result to be outlawed from normal society, even though that form of insanity from which he suffers is permanent and progressive, any more than if he had some permanent progressive organic disease, but not severe enough to render him unfit to take his place in society. The clinical diagnosis of insanity must always be made guardedly, otherwise perhaps not at all. What will do on scientific grounds will not answer practically. The disrepute into which some alienists have fallen is due to failure to differentiate between actual dynamic insanity and actual although only potential as far as overt action goes. Perhaps the legal and the medical profession would be less at loggerheads over this question if they both recognized that there are so many individuals who are either above or below the standards laid down for normal people, but yet not really abnormal, that no hard and fast rule can be applied. It is hard to say with how much actual responsibility an individual who is not actually normal is to be credited. The responsibility for an act is not fixed in any one. It must vary with mental capacity, temperament, environment, education, etc. In legal determinations it were better to take this stand than to try to carve out responsibility from the always vague symptoms that most individuals under suspicion present. Sanity at best is only relative, not only as to the patient, but as to the examiner himself It is just as relative as are disease and health in general.

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THE SIGNIFICANCE OF TUBERCULAR SIGNS IN MILITARY LIFE.

THE orthodox views held during ordinary times on the significance of physical signs in the chest have undergone much change in the minds of some observers, in view of the extraordinary behavior of tubercular individuals while in the military service. The auscultatory signs that previously singled out an individual as tubercular and enforced upon him the most rigid regimen are no longer given the same weight as regards the availability of such individuals for military life. It would seem that the whole fabric of the art of physical diagnosis, developed to such degree in order to discover incipient pulmonary tuberculosis long before the stage of tangible symptoms, and at a period when the chances for cure are hopeful, is given little credence by some of the European military medical men. Fishberg (*Jour. Amer. Med. Assn.*, June 16, 1917) joined these foreign observers in nullifying the significance of physical signs, unless associated with symptoms, as indices of pulmonary tuberculosis. If this view becomes the abiding one in civil as well as military diagnosis, the whole art of physical diagnosis as applied to the lungs must undergo radical revision. It is true that many of the physical signs associated almost entirely with tuberculosis are really of non-specific origin. Yet it is very much of a question whether any pulmonary lesion that gives these physical signs, no matter what the exciting agent or organism, had better not cause the individual to be put under the same strict regimen as those who have undoubted symptoms of tuberculosis. The experience of the European medical officers has been that unless an individual has symptoms—temperature and unstable pulse on slight exertion—as well as signs, he can do as well under a military regimen as those without signs suspicious of pulmonary involvement. Indeed, they maintain that camp life may cure many of these incipients or suspects. Certainly the rigors of military life are not more severe than many of the conditions obtaining in industrial life. There are histories of many English, French, German and Italian cases that were sanatorium patients before the war, and yet who weathered the strict military life without detriment to their health. Osler thinks that the development of tuberculosis during the war has been less than during peace times. This is particularly noteworthy because only the most cursory care could be exercised in excluding the unfit, and one would expect, therefore, much more breaking down than at other times. On the other hand, Osler's figures for this disease in the military service are somewhat to be modified by the fact that the very magnitude of illness and casualty, with the shortage of medical officers, would tend to make much of the morbidity from actual tuberculosis overlooked as such. But, on the contrary, it is quite likely that, at least in so far as initial infection among troops goes, there is very little of it because tuberculosis is really an infection of childhood, the adult infections being really reactivations of dormant tuberculosis contracted in early life. Adult non-infected soldiers are not likely to be infected by a tubercular soldier who managed to slip by the examiner. When the large number of cases of tuberculosis among French troops, placed at over one hundred thousand, and credited to carelessness in examination at a time of emergency, is analyzed, it will be seen that the percentage is actually lower than that during ordinary times.

The belief that adults are not likely to be infected, even from very active cases, unless they have a dormant lesion within themselves dating from childhood, makes necessary a revision of the whole idea of the campaign against tuberculosis—and perhaps these observations on tuberculosis may be one of the many good things arising from an evil. If the force of this campaign can be directed entirely against the infection in childhood, the work will be very much limited and simplified. The whole idea is plausible when it is remembered that the morbidity from some forms of tuberculosis in children is as high as 65%. The limitation of infection in childhood would almost solve the question of tuberculosis in adults, and so generally. The older the individual, the less desirable are his tissues as media for the development of the tubercle bacilli.

On the other hand, these views regarding military tuberculosis are rather radical, if not somewhat premature. It is too early for any observations to revise our whole conception of the physical signs of tuberculosis, and of the significance of this disease with respect to certain activities. Judgment on this whole subject is better reserved until a later period, with many other judgments growing out of present conditions. There is no doubt that in a military emergency much good material is excluded by rejecting all who have signs suspicious of tuberculosis, or because they have been patients in sanatoria. This applies to the exclusion of individuals for other physical defects. Instead of admitting or excluding all who are not absolute on first blush, it would be more in keeping with the selective attitude of our military mobilization to find military employment suitable for every one presented. There is no one for whom a niche of usefulness cannot be found. Those who are otherwise rejected could be made useful to themselves as well as to the service, and, besides, they would be where they could be under observation to determine adverse effects should they arise.

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SPINAL SEROLOGY.

THE importance of the examination of the spinal fluid in diseases of the mind and of the nervous system has been much emphasized of late by the specific spinal findings in such diseases as acute and chronic cerebrospinal affections, parasyphilitic cerebral and spinal conditions, and in tumors of the central nervous system. In the parasyphilitic affections, the blood reaction—the Wassermann—may be negative, and yet the examination of the spinal fluid for the presence of globulin and increase cell content will demonstrate the syphilitic origin of the condition. Dependence on the Wassermann reaction alone would have left the belief that one was not dealing with syphilis. In these late evidences of syphilis of the central nervous system, the infective organism has left the general circulation to become confined within the nervous tissues, and unless the examinations are likewise carried to that system through the examination of the spinal fluid, the correct etiology will remain undiscovered. Intensive study of the spinal fluid by Froin, Nonne, Elsberg and others has brought to light some very interesting spinal fluid findings in other diseases and tumors of the nervous system, of non-specific origin. These findings have been of assistance, not only in the general diagnosis, but as well in differential diagnosis, and have besides been valuable in indicating the advisability of operative intervention.

The elements in the spinal fluid around which these studies have been conducted are the color, the dissolved hemoglobin, the cell content, the globulin content and the coagulability. Normally, the spinal fluid is clear white, and any discoloration or turbidity must arouse suspicion of disease. Turbidity always suggests acute pyogenic infection. Blood suggests the same thing,—hemorrhage from traumatic or other origin, or intramedullary growth. But more particularly, a yellow coloration of the spinal fluid—xanthochromia—was found almost certainly to accompany spinal cord tumor of the lower lumbar or dorsal region. When the yellow color is due to dissolved hemoglobin, and gives the color tests for that substance, and the spinal fluid does not coagulate spontaneously, and, besides, contains very little globulin, the condition is undoubtedly an accompaniment of brain tumor in contact with the ventricles or the meninges. These latter conditions are, however, comparatively rare and do not exemplify the diagnostic significance of the yellow coloration and the allied spinal findings. The more important conditions in which yellow discoloration is found are in the sarcomata and endotheliomata of the conus and the roots of the cauda equina. Accompanying the xanthochromia, is the whole so-called Froin's syndrome, in which there is a clear, transparent yellow spinal fluid, giving no test for hemoglobin, which coagulates spontaneously, and contains an excess of globulin, as well as pleocytosis. An excess of globulin without an increase of the cell count—the so-called Nonne's syndrome—is characteristic of tumors of other levels. But a combination of the important features of both—yellowness, slight or no increase of the cell content, and an increase of the globulin—is characteristic of extramedullary tumor.

Spontaneous clotting of the spinal fluid is observed in acute spinal disease and in acute trauma with intradural hemorrhage. It occurs infrequently in extramedullary growths, but is most common in tumors of the conus and the cauda equina. It is rare in chronic spinal diseases. Increased globulin content is found in many organic spinal diseases. Nearly all spinal tumors have it, especially the extramedullary ones, but it is comparatively rare in chronic pachymeningitis, although it would be expected in chronic inflammatory conditions. The differentiation of extramedullary from intramedullary growths may be made from the cell count. Elsberg and Rochfort found that in the extramedullary growths the highest number of cells to the cubic millimeter was 8, while in the intramedullary ones it was as high as 26. The cell count here would be an important indication for or against operation according as it located the tumor. Moreover, sclerotic conditions of the spinal cord never show an increase in globulin, and hence the presence of globulin in increased quantities would point to tumor of some kind. In neuritis of the cauda equina there is neither an increase in globulin nor in the cell content, and it serves to distinguish this condition from tumor in that region.

Although these spinal findings are of vast help, the development of this diagnostic feature in spinal conditions is still too young to place too much dependence on it. These findings must not be taken as absolute, but rather as highly specialized aids to the usual clinical, laboratory, and other diagnostic methods. While the technic of these findings is for the trained serologist only, every clinician should be conversant with the meaning of the various pictures presented, in order to be able to understand the development and the progress of this part of the medical sciences.

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MEDICAL PREPAREDNESS.

THE problem of medical preparedness in this country may be divided into three parts: (1) the Medical Reserve Corps, (2) the general activities of the National Red Cross, and (3) the special activities of the Red Cross in securing the required number of trained women nurses.

Granting that we have a sufficient number in the Medical Reserve Corps for the needs of the present army of 1,000,000 men, we know that this number is deficient in medical men under the age of thirty-five and deficient in men with certain special training,—for example, orthopedic surgeons.

In addition to this, the probabilities are that the medical profession of this country must furnish its quota for the second and perhaps the third million of men.

Granting that 10,000 medical men is the quota for 1,000,000 men on the firing line, this number of doctors will have to be increased as the reserves are called upon to take the places of the casualty lists. In addition to this, we know that our allies—England, France, Italy and Russia—will require from us a large number of trained physicians and surgeons.

If we desire to meet the medical situation with efficiency, we should prepare ourselves to select from the medical profession in the United States at least 45,000.

At the present time there are about 14,000 physicians commissioned and 7000 in the process of being commissioned. Twenty-one thousand medical officers are about sufficient for an army of 2,000,000. The indications are that we shall need a much larger army, and the medical profession of this country will be tested to its utmost capacity.

At a recent meeting in Chicago of the States Committees of the National Council of Defense it was decided to petition Congress to create a Reserve Medical Officers' Reserve Corps. When this is created, every qualified physician at any age will be given the opportunity and honor to volunteer his services and will be enrolled. After this every physician will be in a position either to wear the insignia of honor of the Reserve Medical Officers' Reserve Corps or the uniform of active service in the Medical Officers' Reserve Corps. From the new Reserve Medical Officers' Reserve Corps the Surgeon-General will be able to select medical officers as they are required for service in France or at home.

The present great problems are: the training of physicians in civil practice for military duty; the protection of the army in training in this country from venereal infection. The future great problem, when our wounded begin to return to this country, will be the reconstruction and reëducation of the crippled soldiers.

DEATH OF DR. HOWE.

THE account of the death of Dr. George P. Howe, which was published in the JOURNAL of November 15, was incorrect in one particular—that of stating that Dr. Howe was not in the Medical Reserve Corps of the United States. Dr. Howe went to Plattsburg for a month during the summer of 1916, and would have liked to try for a commission in the line. His nearsightedness made that impossible, but he did try for the Medical Reserve Corps and received his commission as First Lieutenant about the last of April, 1917. He at once volunteered for immediate duty in France and sailed May 19. When he reached England he found he was to be assigned for British service, and for this reason met his death under the British and not the American flag. He was a very ardent patriot, and when this country entered the war, he felt it keenly his duty to go.

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THE HALIFAX CATASTROPHE.

THE terrific catastrophe which overwhelmed the city of Halifax has evoked the instant sympathy and assistance of America. Almost immediately from New York and from the New England states and larger cities parties of physicians and relief supplies were sent to the scene of disaster. Two medical units were sent from Boston with the equipment originally prepared for the Peter Bent Brigham Base Hospital Unit, besides a large amount of Red Cross material. In next week's issue of the JOURNAL will be published a full account of the personnel and activities of the body of Boston and other Massachusetts physicians who carried out the share of the medical profession in the great work of relief at Halifax.

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MEDICAL NOTES.

AFFILIATION OF MEDICAL SCHOOLS.—Bennett Medical College and the Chicago College of Medicine and Surgery are now combined to form the medical department of Loyola University of Chicago. The purchase of the buildings and equipment of the Chicago College was made recently by Loyola University officials. Dr. Lawrence Ryan is dean of the new faculty of the school, Dr. Alfred de Roulet is junior dean, Dr. G. E. Wyneken is secretary, Rev. H. S.

Spalding, S.J., is regent. The college is on Lincoln Street, opposite Cook County Hospital, in the medical center of the West. The institution comprises five buildings.

Hospital Fire.—The Hotel Dieu Hospital of St. Hyacinthe, Quebec, was destroyed by fire on November 28. There were about 1000 inmates of the hospital, including aged persons and children, and all were removed to places of safety. The institution, managed by the Grey nuns, consisted of three stone buildings, erected at a cost of $600,000.

New Infirmary at Loomis Institute.—Loomis Institute, Windsor, Conn., is to erect a new infirmary, to be a memorial to Gwendolen Sedgwick Batchelder, who was wife of the head master of the Institute, Nathaniel H. Batchelder. The hospital will accommodate twenty patients.

WAR NOTES.

Health of French Army in Macedonia.—It is reported that the health of the French army in Macedonia has been better for the first nine months of this year than during the previous year. The typhoid admission rate was 1.38 per 1000, and that of dysentery 7.43. Malaria is still the most serious cause of disability, but even here there has been a notable decline. In August the rate was 23.8 in 1917, as compared with 39.16 in 1916, and in September it was 29 in 1917, as compared with 74.6 in 1916. The improvement is attributed to better sanitation, free distribution of mosquito nets, and to the practice of administering to each soldier a daily dose of quinine.

Appointment of Attleboro Physician.—Dr. Jerome J. McCaffrey of Attleboro has received his commission as first lieutenant in the Medical Department of the army, and will go at once to Fort Oglethorpe, Ga. Dr. McCaffrey graduated from Holy Cross College in 1911 and Harvard Medical School in 1915.

United States Hospital in Japan.—The American Red Cross has accepted the offer of St. Luke's International Hospital at Tokio, Japan, to use its establishment in case need arises for its use by the military or naval forces of the United States.

Death of Harvard Medical School Graduate.—Dr. Guy French Chandler, a recent graduate of Harvard Medical School, met his death in France from natural causes. He was the son of Dr. Allen Chandler of New York, and had been in ambulance service for the past eight months in France.

Death of Chief Surgeon.—Dr. Jacques Magnin, chief surgeon of the American Hospital at Neuilly, died suddenly on November 25.

Return of Boston Physicians.—Dr. Eugene A. Crockett and Dr. Frederick T. Lord, the surgical and medical members of the American Red Cross Serbian Commission, have reached home after an absence of three months.

Health Conditions in Army Cantonments.—Pneumonia and measles are rampant at Camp Beauregard, near Alexandria, La. Lt.-Col. W. H. Schuffeler, sanitary inspector, reported about 1200 cases of measles, and that many cases of pneumonia have developed from the measles. There have been 22 deaths in three days.

At Fort Oglethorpe, Ga., about 240 cases of mumps and 80 cases of measles have occurred among the 30,000 soldiers. Nearly all those who have died of measles were from states where hookworm rate is high. Soldiers from these states are considered more likely to contract measles than those from other sections of the country.

Surgeon-General William C. Gorgas made a personal inspection of Camp Wheeler, Macon, Ga., where there were about 3000 cases of measles among the 22,000 Southerners at the Camp, and 300 cases of pneumonia with about 60 deaths from this disease during the past month. In reporting conditions found there, he stated that the tendency toward pneumonia undoubtedly was increased by the men being exposed to cold weather for a month in their summer clothing. About two-thirds of the 22,000 men now have been supplied with woolen garments, he said.

He believes the measles epidemic was due to the fact that men at Camp Wheeler were drawn from sparsely settled regions of the South where they had little opportunity to contract the disease when young. The pneumonia cases followed the measles, but the surgeon-general believes most of these were "contact cases," forecasting deaths unless prompt steps were taken.

He recommended that all men in the camp have 50 feet of floor space each, and that such additional shelter be supplied as may be necessary; that no fresh men be brought into the camp until the epidemic has subsided; that an observation camp be established, and that all new men be kept under observation until the main camp is free from infection.

These recommendations already are being carried out. The War Department announced that 1000 additional tents had already been shipped to the camp and the number of men for each tent reduced from nine to five. Woolen underwear reached the camp some time ago, and heavy outside clothing is being delivered as rapidly as railroad congestion will permit.

Casualty Report from General Pershing.—First Lieutenant Wallace Belfey, of Belvedere, Ill., in the Medical Officers' Reserve Corps, was seriously wounded in action. He was detailed for service with the British forces in

France. General Pershing also reported the death of ten soldiers, four of whom died of pneumonia, two of septicemia following wounds, and one of cerebrospinal meningitis.

CALL FOR NURSES.—The Medical Department of the army has issued a call for 500 graduate nurses to serve in the Army Nurse Corps at base hospitals established at the National Army and National Guard cantonments. Each division has hospital accommodations for one thousand patients at the base hospital and will require sixty-five trained nurses, who will be paid $50 a month and maintenance. Applications should be addressed to the Superintendent, Army Nurse Corps, Mills Building, Washington, D. C.

WAR RELIEF FUNDS.—On December 8 the totals of the principal New England war relief funds reached the following amounts:

French Wounded Fund	$302,426.67
Armenian-Syrian Fund	265,139.89
French Orphanage Fund	132,989.11
Polish Fund	91,631.73
Italian Fund	60,276.94

BOSTON AND MASSACHUSETTS.

WEEK'S DEATH RATE IN BOSTON.—During the week ending Dec. 8, 1917, the number of deaths reported was 240, against 209 last year, with a rate of 16.20, against 14.33 last year. There were 36 deaths under one year of age, against 28 last year.

The number of cases of principal reportable diseases were: diphtheria, 151; scarlet fever, 31; measles, 73; whooping cough, 54; typhoid fever, 2; tuberculosis, 45.

Included in the above were the following cases of non-residents: diphtheria, 13; scarlet fever, 4; tuberculosis, 3.

Total deaths from these diseases were: diphtheria, 5; scarlet fever, 1; measles, 2; tuberculosis, 20.

Included in the above were the following non-residents: diphtheria, 1; tuberculosis, 1.

GIFT OF HOSPITAL TO CITY OF MALDEN.—Mr. and Mrs. Costello C. Converse have presented to the City of Malden the Colonel Harry E. Converse estate, to be used as a maternity ward. The estate includes a house of forty rooms, a stable, garage and grounds. The hospital trustees, in accepting the gift, voted to appropriate the sum of $8000 to make necessary changes.

FREE HOSPITAL FOR WOMEN.—The forty-second annual report of the Free Hospital for Women, Brookline, recently published, states that 990 patients have been admitted to the hospital in the past year, and 1993 new patients have been treated in the out-patient department. There were 2326 operations performed.

Obituary.

SAMUEL PARKER COTTRELL, M.D.

SAMUEL PARKER COTTRELL, M.D., formerly of Boston, died at Newport, R. I., on the first day of December. Dr. Cottrell was born in Newport in 1861, and graduated from Jefferson Medical College, Philadelphia. In 1883 he went to St. Paul as professor of children's diseases in St. Paul's Medical College, and remained there until 1886. Two years later he removed to Boston. For six years he held the position of assistant surgeon at the Massachusetts Women's Hospital. He was lecturer at Tufts Medical College from 1894 to 1898, and also served as chief surgeon at the Boston Emergency Hospital. Upon the outbreak of the Spanish-American War Dr. Cottrell entered the Medical Corps of the army and was assigned to the United States General Hospital at Fortress Monroe, and later to duty in Cuba and the Philippines.

Dr. Cottrell was a member of the Newport Board of Health, was vice-president of the Anti-tuberculosis Society of Newport, a member of the Rhode Island Medical Association, of the Massachusetts Medical Society, honorary member of the Rhode Island Dental Society, and a member of the American Medical Association. He is survived by two brothers and a sister.

THOMAS FREEMAN MOSES, M.D.

DR. THOMAS FREEMAN MOSES, a Civil War veteran, died at his home in Waltham, Mass., on November 21. Dr. Moses was born in Bath, Me., on June 8, 1836, the son of William Vaughan Moses and Sarah Moses, and was a descendant of Elder Brewster, the Pilgrim. He was graduated from Bowdoin College in 1857, and received his degree of A.M. in 1860. He received his medical education at Jefferson Medical College in Philadelphia, and after his graduation in 1861, he went abroad for a year or more of study in Paris.

On his return to this country, Dr. Moses served in the Civil War as acting assistant surgeon, U. S. A. In 1870 he went to Urbana, Ohio, where he was first professor in the University of Urbana, and, from 1886 to 1894, was its president. He then retired from active work and made his home in Waltham, Mass.

Dr. Moses was a Fellow of the American Academy of Medicine and a member of the Geological Society of America, besides being a frequent contributor of papers to scientific societies. He is survived by his widow, four sons and a daughter.

Miscellany.

INFANT MORTALITY PREVENTION IN MASSACHUSETTS.

The Massachusetts Association of Boards of Health held its quarterly meeting on October 25, at Pittsfield, Mass. Dr. William J. Gallivan spoke on "Child Conservation in Time of War." He stated that statistics on infant mortality among the warring nations of Europe show a decrease in infant deaths of fifty per cent.

"It is estimated," said he, "that this great saving of young lives will, in one generation, balance the enormous losses caused by war, so that in twenty years those European nations which are conserving child life will be as strong numerically as they were at the outbreak of the war, notwithstanding the immense losses reported.

"Such an announcement stirs one's blood. American communities which for years have looked with complacency upon infant mortality rates in times of peace, four times as high as European nations are reporting in times of the world's greatest war, ought to be shamed into action. Always a pioneer in matters pertaining to health, Massachusetts, under the leadership of Dr. Allan J. McLaughlin, State Commissioner of Health, has undertaken the work of child conservation. The Commonwealth has been divided into eight health districts. Each district is presided over by a district health officer. To each district has been assigned a nurse, who will be assisted by a corps of volunteer aids. This machinery will be directed by a Committee on Conservation of Child Life, appointed by the State Commissioner of Health.

"It is planned to make a survey of every city and town, every village and hamlet in the State. This survey will include an exhaustive study of the mortality and morbidity statistics of children under the age of five years, the generally accepted period of school age, and a compilation of the agencies in each area which provide continuous, competent medical care. This survey will disclose the conditions. The remedy for the condition will be applied by the Committee on Child Conservation, who look upon local boards of health as their strong right arm in this venture.

"The work of the committee is well under way. In some cities and towns, the survey has been completed, and we are ready to go into these cities and towns and say: 'In this city last year 100 babies died. Of this number, 90 died of preventable disease. You have in this city a milk station where the feeding of infants can be supervised, but you have no facilities for expert obstetrical care, including prenatal care.'

"And so over every square foot of Massachusetts this survey will be made, the condition noted, the remedy recommended, and the solution carried into execution.

"The most important factors in child conservation are prenatal care, obstetrical care, and infant feeding. A recent report of the Children's Bureau at Washington states that 40% of infant deaths in this country occur during the first month of life.

"Such surveys as we are making in Massachusetts would undoubtedly disclose the fact that such deaths in large part were due to prenatal conditions, either medical, social or industrial. The minimum requirements for the proper conduct of an obstetrical case ought to be standardized by the State Department of Health. Cases which are unable to conform to the minimum requirements ought not to be cared for at home.

"Disorders of nutrition are responsible for the lion's share of infant mortality the world over. Everybody agrees that breast-fed babies never die of enteric disease. Therefore, breast-feeding should be universally encouraged by attending physicians. Bottle-fed babies do well only under constant supervision of competent medical men.

"The mortality rate of children from one year to 5 years is principally due to communicable disease and its sequelae. Proper enforcement of existing regulations for isolation would do much to lower this rate. Teeth and tonsils are recognized as important objects of inspection during this period.

"Coördination of existing agencies; elimination of overlapping, if any such exist; creation of new agencies where required; publicity of the widest kind to annihilate the superstitions and errors which have prevailed concerning the occurrence of illness; and the punch which an enthusiastic and expert central body can exercise, are the weapons relied upon to bring this work to a happy consummation."

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INFANT MORTALITY IN PANAMA CANAL ZONE.

Although it is difficult for white men accustomed to living in a temperate zone to adjust themselves to life in the tropics, a recent study made of infant mortality rates in the Panama Canal Zone demonstrates that infant life depends more on receiving proper care than on proper climate. A comparison of death rates in children under one year of age shows that the rate for the Panama Canal Zone is lower than that for the United States.

"The totals on the Isthmus, including military garrisons, show an average mortality for babies in the last seven years of 41.09 per 1000 births, while for the last comparable period in the whole United States the rate has been 10 deaths per 100 births. In other words, one child out of every ten born in the United States dies before reaching its first birthday, while in the Canal Zone only one American child out of twenty-five born fails to live to be a year old. Favorable as this showing is in comparison with the experience in the United States, it is even more so in its relation to the infant death rate in other countries. In Austria before the war, 180 children out of every 1000 born died before they were twelve months old, and in Germany, where the birth rate is slightly lower, yet where, it is presumed, the boasted science of living has been developed into a fine art, 147 babies die where every 1000 are born. The figures reach tragic proportions in Russia, where the death rate is 248. The only countries having as low as 100 are, in addition to the United States, Australia, 71; France, 78; and Sweden, 71. Besides these showings, which are chiefly of the years 1912-1914, the modest 38 to 41 of the Canal Zone stands out in shining distinction.

The significance of this saving in human life is explained by the conditions under which the Government makes it possible to exist and thrive on its own reservation. The reasons attributed by the Panama Canal record for the low infant death rate on the Isthmus may be summarized as follows:

1. Employees and their families in the Canal Zone are on a higher economic plane than the average family in the United States.
2. Treatment in the dispensaries and hospitals in the Canal Zone is readily available, and is furnished free or at a very low cost.
3. Most children are born in the hospitals, where both mother and child are under the care of experienced physicians and nurses during the critical period of the first week or ten days of the child's life.
4. Infants in the tropics escape the varying changes of temperature and season that those in the United States must pass through.
5. The mother in the Canal Zone has more time to devote to her offspring than the average mother in the United States. Many mothers there are obliged to work for wages to contribute to the family's income.
6. If artificial feeding is required, milk above the average obtainable in the United States is available. Proper milk formulas and free advice are given by competent physicians.

While the infant mortality rate among white American children is particularly low, the reverse is true among the native-born and West Indian children. The mortality rate among infants on the Isthmus under one year of age (taking all births reported for the Canal Zone and the cities of Panama and Colon) was 223.8 for 1915, and 216.8 for 1916. This was more than double the rate for the registration district in the United States for 1915, and higher than any foreign country from which we have statistics, with the exceptions of a rate of 248.0 for Russia in 1909, and 286.0 for Chile in 1914. The high death rate can be attributed to several causes, such as:

1. The majority of children are born at home, amid unhygienic surroundings, and often without proper care at time of birth.
2. Ignorance of mothers in the proper care of their children.
3. Malnutrition, etc., due to the low economic status of a large per cent. of the population.
4. The crowding together in tenement houses of many of the poorer classes, several persons often living and sleeping in one room.

While the birth rate per gross thousand population among the American population on the Isthmus is much lower than in the United States and foreign countries, this is readily accounted for by the relatively small number of American women on the Isthmus in proportion to the total American population. Particularly is this true among the military garrisons. The birth rate among the native-born and West Indian population, however, is almost double that of New York City, which is about 26 per thousand.

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AN EPISODE OF ROYAL OBSTETRICS.

In the issue of the *Lancet* for October 27, 1917, is published upon the authority of Dr. F. B. Clippingdale, the following vindication of the medical reputation of Dr. Sir Richard Croft, to whom great blame has undeservedly been attached for the death in childbirth of H. R. H. Princess Charlotte of Wales. An untoward event announced in the *London Gazette Extraordinary* at the time as a tragedy in the annals of English obstetrics:

" 'Her Royal Highness the Princess Charlotte of Wales was delivered of a stillborn male child at nine o'clock last night, and about half-past twelve Her Royal Highness was seized with great difficulty of breathing, restlessness and exhaustion, which alarming symptoms increased till half past two o'clock this morning, when Her Royal Highness expired.'

"The Princess was in her twenty-first year. Her grandmother, Queen Charlotte, had been attended in her 13 confinements by a midwife, a Mrs. Draper, with the happiest results. When, however, the Princess Charlotte was known to be pregnant and an heir to the Throne anxiously desired, it was decided to take every possible precaution. Hers was the first Royal accouchement to be attended by male practitioners. Three were employed—Dr. Mathew Baillie, Dr. John Sims, and Sir Richard Croft. Of these, Sir Richard Croft was regarded as a specialist and controlled the case. Croft, although he appeared as a maternity specialist, apparently possessed no medical qualification. He was at Oxford for a short time, where Foster, in his 'Alumni Oxoniensis,' describes him as 'chirurgus privilegiatus,' but mentions no degree. He was not a Member of the Royal College of Physicians, was not upon the staff of any hospital, nor had he contributed anything to medical literature. He was, however, a man of high social position, and possibly his social position had something to do with his Court appointment. He inherited a baronetcy conferred upon his ancestor by Charles II. He married a twin daughter of Dr. Denman, the famous obstetrician (to whose practice he succeeded). Dr. Baillie, his colleague, married the other twin, so that there was a personal as well as a professional relationship between these gentlemen. The Court wished the Princess's confinement to take place at Kensington. The Princess, however, preferred Claremont, 15 miles away, and, at that time, not easily accessible. The labor was protracted and abnormal. There was hour-glass contraction of the uterus. The infant was known to be dead some hours before it was born, yet no steps were taken either to remove it or to terminate labor. The Princess was in an enfeebled condition from low diet, repeated bleedings, and unrelieved bowels. Finally there was post-partum hemorrhage. A Mr. Jesse Foot demanded a public inquiry, stating, upon the report of the nurse, that when the infant was born, all three doctors were fast asleep. This, however, was denied by Dr. Sims, who, in a letter which will be found in Playfair's 'Midwifery,' says: 'It has been said we had all gone to bed, but this is not a fact. Baillie retired about 11 and I lay down in my clothes at 12, but Croft never left her room.' A path is still shown at Claremont where Sir Richard Croft had walked up and down in agony not knowing what to do for the best, and Foot's statement that he went to bed is a libel. By command of the king a post-mortem examination was made by Sir Everard Home and Sir David Dundas, who reported to the king that there was no evidence of neglect, but that everything had been done which 'human science could devise or human skill effect.' The event so preyed upon the mind of Sir Richard Croft that three months later he shot himself."

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INFANT MORTALITY IN CALCUTTA.*

"To read of an infant mortality approaching 500 per 1000 makes one pause and examine the figures to see if by any chance the printer has not left out the all important 'point'; yet 478 and 453 per 1000 are the correct figures for the Alipore and Jorabagan districts of Calcutta as given in Dr. H. M. Crake's annual report for 1915. In the former district there has been an exceptional rise, the usual rate being slightly over 300 per 1000; but in the latter the figure is not so surprising, for Dr. Crake describes it as an 'intensely congested quarter with great masses of buildings intersected by narrow gullies and its hundreds of tenement houses packed with humanity.' The suburban wards, though more open, contain 'thousands of poor families, wretchedly housed in damp, dirty huts, surrounded by grossly insanitary conditions,' all of which is 'obviously inimical to child life.' These external conditions are bad enough in themselves, but when combined with the foolish and pernicious practices followed by the women as a sort of religious ceremony, the appalling death rate is not without a sufficient explanation. The primary causes of so large a loss of infant life are not so far to seek. Poverty, dirt, insufficient food, confinement in foul dwellings, and the strain of frequent pregnancy and lactation inevitably produce puny, sickly babies, who survive only a few days. Next to congenital disability as an immediate cause of death, comes tetanus neonatorum—a wholly preventable disease, due entirely to dirty midwifery. The outstanding fact that not a single case of the disease has occurred among the babies brought into the world by the Corporation midwives is incontrovertible proof that these deaths are solely due to the filthy practices of the native midwife. After the first month there is a marked drop in the mortality and then, curiously enough in a sub-tropical climate, bronchitis and respiratory diseases come to occupy the chief place among the causes of death. Possibly some explanation of this phenomenon is to be found in the physiological fact that the young of all warm-blooded animals are particularly susceptible to changes of temperature, and among the poorer classes of natives, clothing for infants and children is considered superfluous, thus what vitality the infant may have is checked, and they are rendered more liable to be affected by the unsanitary surroundings. As part of the same problem 'diseases of child-bed' figure largely. In Calcutta they amount to about 1 in every 40 as compared with 1-2 per thousand in England. For similar reasons the incidence of tuberculosis among girls and young women is from three to six times as great as it is at the corresponding age periods among males.

"Such conditions cry aloud for a well-organized welfare scheme, which would do an immense amount of good if the mothers could be induced to take part; but Dr. Crake sees no immediate prospect of success for an institution of that kind in Calcutta. The health committee, however, have lately appointed a second health visitor and additional midwives, but there is as yet no satisfactory provision for looking after the infants during the first few critical weeks. As an experiment, a suggestion has been made to establish a small babies' clinic in connection with the Dufferin Hospital, to be conducted on lines similar to the welfare centers in this country. As an inducement for mothers to attend, a conveyance will be provided, and a small sum paid for each attendance by way of 'backsheesh.' Should this prove a success, a way will be opened through the barriers of ignorance, superstition and social custom, which now stand in the way of progress; and future years may see a development of the infant welfare movement such as is urgently needed in the city of Calcutta."

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* The Medical Officer, September 29, 1917.

WAR ACTIVITIES FOR ANTI-TUBERCULOSIS ASSOCIATIONS.

The National Association for the Study and Prevention of Tuberculosis offers the following suggestions for the consideration of state and local associations. They are formulated as the result of conferences with army officers, public health officials, and officers of the Young Men's Christian Association, Knights of Columbus and others engaged in war work. They have been found practicable in four cantonments, where the medical field secretary of the National Association has inaugurated these activities in coöperation with state anti-tuberculosis associations.

I. Procure a record of men rejected for service in the army because of tuberculosis or suspected tuberculosis.

1. Those rejected by local examining boards.

There are 4557 of these local boards in the United States. While the "Regulations provide that the records of local exemption boards be made accessible to the public at such time as will not interfere with the work of these boards," as a matter of fact it has been exceedingly difficult to get the information desired by anti-tuberculosis associations. On September 29 the provost marshal, General Crowder, directed to The National Association for the Study and Prevention of Tuberculosis a communication establishing the authority of the governors of the several states to direct these boards to open their exemption records to representatives of the National Association or to representatives of the State Boards of Health. Copies of this letter from the War Department have been sent to all state boards of health and to state anti-tuberculosis agencies. It is suggested, therefore, that these names be secured and follow-up work be done as suggested below.

2. Rejected applicants for enlistment in the United States Marine Corps.

The commandant has directed all recruiting officers in the United States to report to the National Association the names and addresses of those applicants rejected because of tuberculosis or suspected tuberculosis since January 1, 1917. Not infrequently the applicant resides in a different state than the one in which he applied for admission to the Marine Corps. All these names are being reported to the proper state boards of health, and a copy of the report is being sent to the secretary of the state anti-tuberculosis association, or in case the man is from a large city, to the city anti-tuberculosis agency where he resides. Follow-up work as suggested below may be done for these men also.

3. Those rejected by regimental surgeons in the camps and cantonments.

In the hurry of the preliminary examinations for the draft, many tuberculous men were overlooked by the local examiners. In the examination at the camps by the regimental surgeons many of these overlooked cases are being found. Still other cases will be discovered by the special boards of expert examiners, which will later make surveys of the camps. The records of all cases rejected in camp are in the office of the division surgeon. In four camps the division surgeon has made available to the secretary of the state anti-tuberculosis association the names and addresses of those men rejected because of tuberculosis or suspected tuberculosis. We have found the military surgeons most courteous and ready to coöperate. We believe that such records in other camps and cantonments than those visited will be made accessible if the matter is fully explained.

If the secretary of any state association is unable to secure these names, it is probable that he can successfully point out to the division surgeon the desirability of reporting the names to the state boards of health of the states from which the men came. In those states in which there is no law requiring that tuberculosis be reported there may be some objection offered.

II. Follow-up work for all cases discovered.

This may be done by the distribution of educational literature. Pamphlet No. 106, "What You Should Know About Tuberculosis," issued by the National Association, is an excellent one, which is being distributed to Canadian soldiers. "Don't" cards have some value also. Health placards for street cars and public buildings should not be forgotten. They will be read by the man who has been discharged from the service on account of tuberculosis.

Visiting nurses should be asked to make a survey of the families of rejected conscripts, giving them verbal instructions, getting them to go to the family physician for physical examination, or to the dispensary.

Suitable cases should be induced to enter sanatoria.

III. Educational work for soldiers.

1. For the officers and privates of the line.

Most of this educational work can best be done in coöperation with the Young Men's Christian Association and the Knights of Columbus. These organizations have service buildings in which the men gather for entertainment and recreation. The Y. M. C. A. has several buildings in each cantonment, including an auditorium and an administration building. The general secretaries of these organizations should be consulted and arrangements made for the distribution of literature.

RESEARCH WORK AT THE FORSYTH INFIRMARY.

ONE of the most striking advances in the technic of dentistry is apparently foreshadowed by investigations and the development of methods at the Forsyth Dental Infirmary, whereby much of the labor and inconvenience of tooth excavation may be avoided, and a smooth, antiseptic base may be afforded for fillings, a base which may be applied almost with the facility of running water. The material is metallic silver, applied in the form of nitrate and precipitated by the action of formalin. The discovery comes in sequence in the work of a department of research which the infirmary has established.

The special matters in which the new process possesses advantages include chronic abscesses, in which a goodly number of cases, "the discards of a large clinic," have been treated at the Forsyth Infirmary. In troubles with the tip of the tooth it has proved efficacious.

This method of treatment is the outgrowth of a series of experiments conducted by Dr. Percy R. Howe, director of the laboratory, who presents a statement of his work in the *Dental Cosmos* for September. In a general way, the application of the new process may be described as sterilizing the whole of the decaying tooth pulp without removing any of it, and by a process extremely simple. The silver will be deposited on all exposed surfaces, forming a smooth, metallic covering. This may be the basis for usual filling processes. The extreme is, however, not recommended by Dr. Howe, but whenever the excavation is judged to be sufficient, the surfaces exposed may then be silver coated. This method of precipitating silver is much the same as that employed in the arts, in the making of mirrors for telescopes, etc.

Being in liquid form, the solutions penetrate throughout the putrescent pulp, into the neighboring parts of the tooth, where the advance rings of incipient decay have gone, and they follow cracks in the tooth material and canals. Wherever the formalin overtakes the nitrate, metallic silver is deposited, and here decay will be arrested, and this will occur everywhere that decay has started or where accidental or natural fissures exist. Repeated applications to an exposed surface will result in a very appreciable thickness of deposit, which may be burnished if wished and made to take on the luster of the metal.

RECENT DEATHS.

STEPHEN HULL SEARS, M.D., died at his home at Yarmouthport, November 25, 1917, of angina pectoris, aged 63. Dr. Sears had practised in Yarmouthport since 1900. He was a graduate of Bellevue Hospital Medical College, New York, in 1879.

DR. CHARLES H. S. DAVIS, of Meriden, Conn., died at the State Hospital, Middletown, Conn., on November 7. Dr. Davis was born in 1840. He was the author of books on medical and historical subjects. From 1873 to 1886 he was a representative in the State Legislature and was twice mayor of Meriden.

SOCIETY NOTICES.

BOSTON MEDICAL LIBRARY IN CONJUNCTION WITH THE SUFFOLK DISTRICT MEDICAL SOCIETY.—Medical Section meeting in John Ware Hall, Wednesday, Dec. 12, 1917, at 8.15 P.M.

The Treatment of Invalided Sick and Wounded
Major Edgar King, Medical Corps, U. S. Army.
Vocational Aspects of Reconstruction Work.
David L. Edsall, M.D.
Plans for Boston's Share in Surgical Reconstruction Work. Frederic J. Cotton, M.D.
Light refreshments after the meeting.
EDWIN A. LOCKE, M.D., *Chairman*,
GEORGE R. MINOT, M.D., *Secretary*.

THE NORFOLK DISTRICT MEDICAL SOCIETY.—A regular meeting of the Society will be held at the Robert Bent Brigham Hospital, Parker Hill, December 18, at 7 P.M.

Inspection of the hospital under the personal direction of Charles F. Painter, M.D.
Demonstrations in Therapeutics
F. H. McCrudden, M.D.
Medical Treatment of Chronic Arthritis
C. H. Lawrence, Jr., M.D.
Focal Infection in Chronic Arthritis.
L. M. Spear, M.D.
BRADFORD KENT, M.D., *Secretary*.

WORCESTER DISTRICT MEDICAL SOCIETY.—Next regular meeting, Wednesday, Dec. 12, 1917, at 4.15 P.M., G. A. R. Hall, 55 Pearl Street, Worcester.

Subject "Child Welfare."

This meeting is at the request of and in conjunction with the Worcester Committee on Child Welfare. The Speaker will be Dr. Fritz B. Talbot of Boston, whose subject is "Child Welfare Work in Massachusetts as a War Measure, with Special Reference to the Work of the State Committee on the Conservation of Child Life."

Any effort to offset the tremendous wastage of human life, now taking place and impending, challenges our active interest and support. Members are therefore requested to invite their friends, and the general public is hereby invited, to be present at this meeting and to participate in such patriotic effort as may result from it.

The War Committee desires to acknowledge the splendid way in which Worcester physicians have fulfilled our agreement with the Red Cross to furnish gratuitous medical service to needy families of soldiers. In order that this burden may be distributed as lightly as possible, it is desirable that every physician in this community notify the Committee of the number of calls he will make and the number of maternity cases he is willing to attend during 1918. Please telephone or write the secretary that he may systematize the distribution of future calls.

M. F. FALLON, *President*,
E. L. HUNT, *Secretary*.

MIDDLESEX EAST DISTRICT MEDICAL SOCIETY.—A meeting will be held on December 19, at 8 P.M., at the home of Dr. H. B. Jackson, 98 West Emerson Street, Melrose. The evening will be devoted to reports of cases.